

AVIATION WEEK

A MCGRAW-HILL
PUBLICATION

December 9, 1957 75 cents

Sabreliner Fits
USAF Shelf Item
Trainer Concept



North American F-107A

Test Facilities for Thor, Atlas, Titan

1102—First lightweight all-metal under car

1103—First narrow lightweight gang chassis

1104—First narrow lightweight floating under car

1105—First narrow under car

1106—First narrow floating under car

1107—First deep undercarriage floating under car

SETTING STANDARDS OF PROGRESS

1108—First narrow/lightweight floating box car

1109—First lightweight A-101 narrow-gauge rail steel under car and box car

1110—First complete line of 1000-lb-weight rail undercarriage rail

1111—First lightweight high speed TE set car

KAYLOCK

essential self-locking nuts

'symbol of leadership'

KAYMAR MFG. CO. INC. has become the world's leading manufacturer of lightweight oil metal self-locking aircraft nuts.

- All metal, rugged one piece construction
- Highest strength, lightest weight, lowest height
- Self-locking torque — "Infinitely" reusability

Kaylock Nuts conform to all Air Force-Military standards: AN302, AN304, AN305, AN306, and the new low height lightweight National Aircraft Standards.

Kaylock Nuts available in steel or A-286 stainless-steel for use to 1200° F.

"The Most Copied Nut In The World"

KAYMAR MFG. CO. INC. KAYLOCK DIVISION Dept. AD
Box 500 | Inverness, Texas 75629
Commercial: 817/265-0000 | Domestic: 800/265-0000
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TWICE THE HUSTLE



with

HALF THE MUSCLE!

Today, thanks to a complete ground support system conceived, designed and engineered by Goodyear Aircraft Corporation, mobile squadrons have more "muscle" — require less a fraction of the "muscle" previously expended to transport, set up and go into action.

- The number of vehicles required has been drastically reduced.
- Only one engine type — already in world-wide Air Force inventory — is employed. It provides the power needs for vehicles as well as electronics and maintenance equipment.
- Now only one type prime mover of "universal design" is required. It can execute any movement required within the squadron, carry any one of the specially Goodyear-engineered "packs" of ground-handling equipment, and load the tankers which were also built by Goodyear Aircraft.
- Each pack can be "reconfigured" for clearance. As a result, tanks and entire systems are air-transportable — ready moved to strategic areas in a hurry.

Once there, the squadron can transport tanks, helicopters, unguaranteed — even through swampy areas, change location in a matter of hours — thanks to the huge, low-profile "Go Anywhere" TerraTire developed by Goodyear.

The extraordinary mobility, adaptability and practical logic that went into this new design concept — engineered and executed in the smallest detail by Goodyear Aircraft.

They're doing big things at

GOODYEAR
AIRCRAFT

*Plants in Akron, Ohio, and Lockheed Park, Arizona
Overcoming Challenges and Creating for Engineers
The Goodyear Tire & Rubber Company, Akron, Ohio*



Aircraft Controls



BARBER-COLMAN TEMPERATURE CONTROL SYSTEMS

A proprietary, zeroed-in, zeroed-out system is applied to the B-52 the complete line of Barber-Colman temperature controls for aircraft includes Cycling thermostats, Heating electronics, Transducer magnetic amplifiers, gas control relays.



CONTROL VALVE



VALVE



CONTROL UNIT

Barber-Colman temperature controls selected for B-52 detachable pod

Aircraft's first temperature controller, the USAF B-52 "Bladder" built by Convair, is designed specifically to carry a detachable "pod" under its fuselage. With these capsules, this versatile plane is capable of performing a wide variety of missions. To maintain a constant temperature is a pod flight test equipment compartment, Convair has chosen a Barber-Colman temperature control system. Other Barber-Colman equipment is furnished to contractors of the B-52 air conditioning systems. For help on your control projects, consult the Barber-Colman engineering sales office nearest you. Los Angeles, Seattle, New York, Fort Worth, Baltimore, Montreal.

CAREER OPPORTUNITIES Excellent openings for qualified engineers

BARBER-COLMAN COMPANY

Dept. X, 1422 Oak Street, Rockford, Illinois

Aircraft Controls • Electrical Components • Avionics Controls • Instrument Instruments • Air Distribution Products • Small Motors • Overhaul and Operators • Milled Products • Metal Cutting Tools • Machine Tools • Tension Members

AVIATION CALENDAR

- Dec. 9-10-1957** Eastern Joint Computer Conference and Exhibit, Sheraton Park Hotel, Washington, D. C.
- Dec. 10-14-57** Agents of Army Air Materiel, sponsor the Civil Servant in Business Division of Development, Office of Chief of AEC, Dept. of Army, sponsored by American Helicopter Society, 6:30 p.m., Stevens Restaurant, Philadelphia International Airport.
- Dec. 16-17-1957** Conference on Utilization of Engineers and Scientists, University of Missouri-Columbia, Columbia, Mo.
- Dec. 16-18-57** Traffic Control Symposium, "The Nation and Methods of the Airway Modernization Board," sponsored by Traffic Institute, Sheraton Hotel, Philadelphia, Pa.
- Dec. 17-18-57** Wright Brothers Lecture-Symposium Night and the 25th Anniversary, H. Julian Allen, NACA, National History Building, Audubon, Smithsonian Institution, Washington, D. C.
- Dec. 18-57** Civil Traffic Development, speaker: Rear Adm. S. S. Springer, USAF, Air Development & Material Center, at Langley Club, Philadelphia, Pa.
- Jan. 6-8-1958** National Symposium: Electronic Reliability and Quality Control, Hotel Statler, Washington, D. C.
- Jan. 11-17-1958** Annual Meeting Society of Automotive Engineers, Sheraton Capital and Hotel Statler, Detroit, Mich.
- Jan. 13-14-57** Lecture series on Space Technology, sponsored by University of California and Aero-Worldwide Corp. to be held in Los Angeles, San Diego and San Francisco. For details write: University of California Extension, Dept. of Cosmochemistry and Special Activities, Los Angeles 24, Calif.
- Jan. 14-15-1958** Instrument Fair & Symposium sponsored by Instrument Society of America (Boston, Connecticut Valley and Fairfield County Sections) Hotel Fairfield, Boston, Mass.

(Continued on page 6)

AVIATION WEEK • DECEMBER 5, 1957

Vol. 47, No. 23

Published weekly with an additional issue on December 16, 1957. Published by the American Society of Mechanical Engineers, 345 East 47th Street, New York 17, N.Y. Second-class postage paid at New York, N.Y., and at additional mailing offices. Postmaster: Send address changes in New York, N.Y., to ASME, Attention: Circulation Manager. Outside New York, N.Y., to ASME, Attention: Circulation Manager, c/o National Air Mail, Inc., 1000 Broadway, New York 17, N.Y. Payment in Advance. Single copies 15¢. Subscriptions: One year \$3.00. Two years \$5.00. Three years \$7.00. Four years \$9.00. Five years \$11.00. Six years \$13.00. Seven years \$15.00. Eight years \$17.00. Nine years \$19.00. Ten years \$21.00. Twelve years \$23.00. Fifteen years \$25.00. Twenty years \$27.00. Twenty-five years \$29.00. Thirty years \$31.00. Thirty-five years \$33.00. Forty years \$35.00. Forty-five years \$37.00. Fifty years \$39.00. Fifty-five years \$41.00. Sixty years \$43.00. Sixty-five years \$45.00. 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The Bell AH-64 Apache powered
by the Army's powerful
engine of tomorrow



DISTINGUISHED PERFORMANCE ...PLUS ECONOMY!

In designing rotor blades for the AH-64, the Army's most advanced utility helicopter, Bell Helicopter engineers were seeking a structural design that would combine outstanding performance with hydrolic fabrication economy.

The solution? A uniquely different kind of rotor blade composed of multiple layers of thin-gage, contoured aluminum sheets, bonded into an homogeneous structure with a high performance, high peel strength structural adhesive. This structure offers a host of performance and fabrication advantages... outstanding aerodynamic smoothness, low maintenance, excellent cutting qualities, high corrosion resistance, plus complete absence of assembly difficulties. Furthermore, by completely eliminating stress concentrations, the bonded structure takes full advantage of the optimum fatigue life of the blade configuration.

Best of all, the bonded blade design has resulted in a dollar savings of 40 percent as compared with a conventional tapered forging design.

The adhesive used to accomplish the unusually large area bonding required in the fabrication of these laminated blades? A Narmco product, naturally... High peel strength, high fatigue resistant Methbond 4021P... one of a good family of adhesives and metal-to-metal adhesives designed specifically to accomplish the toughest jobs in aircraft and missile designs.



PERFORMING THROUGH RESEARCH

NARMCO RESINS & COATINGS CO. 261 S. 18, 406 VICTORIA DRIVE, COSTA MESA, CALIF.
LOS ANGELES SEATTLE PORT WORTH DALLAS TULSA PHILADELPHIA CHICAGO

Outsize advantages of bonded hull of the B-440 ship, showing how the structural aluminum sheets and structural aluminum plates are bonded with Narmco Methbond 4021.

NEW FROM NARMCO Narmco® 195

The first structural adhesive hulls she with hull in lifting without. Complete bonded area available upon request.

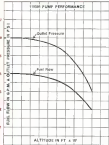
Write today for specific performance and fabrication data on NARMCO structural adhesives. Return today's 7-11 coupon. One completed (United States and Canada) can mail in spring year to extend the up-to-date pricing, availability, economically.



MIGHTY MITE

...that pumps up every last drop of fuel even at extreme altitudes!

1/2" INCH FUEL PUMP
FOR AN CYCLE SINGLE PHASE MOTOR 1/4-1/2 HP/175



To conserve the fuel which would normally be trapped in the lower portions of the fuel tanks—that's the job of Whittaker's AC electric motor operated pressure or duty fuel pump!

And this Whittaker Photo-Fin pump does the job with half the weight and one-third of any other pump—and at extremely high altitudes! The unit runs continuously after fuel level reaches a pre-determined point to reset switch back the pump on.

Since entire motor and gear body are submerged, no shaft seals are required. Pump operates on very low current, and is capable of lifting fuel, pushing air and sucking dry for indefinite periods. Integral motor thermal protection is optional.

PERFORMANCE

TEMPERATURE: Ambient -80° + 180°F. Fluid -45° + 180°F.

ELECTRICAL POWER REQUIRED: 400 cycle

115V single phase alternating current

SERVICE FLUID: Aircraft fuels JP-4 and JP-5

WEIGHT: 5 lb. provide 100% duty cycle, 100 inches, height, 20 inches width, 20 inches



This unit is now in production and available for use whenever a fuel conserving problem exists.

Whittaker

CONTROL SYSTEMS

Fuel-Hydraulic-Pneumatic

A Division of Teleconcepts Corp.

Los Angeles • Seattle • Wichita

Teleconcepts • Washington, D.C.

Whittaker Long Island

SEND THIS COUPON FOR COMPLETE INFORMATION

Whittaker Controls

Dept. 356

978 N. Colton Avenue, Los Angeles 28, Calif.

Enclosure: Please send me further information on the

Whittaker (See page 10) Fuel Pump. P. 30 (10/20)

Check one: ☐ Reference Information ☐ Product Information

Name _____

Company _____

Address _____

City _____ State _____



J-1300—new iron-base turbine alloy

**Easier to forge . . .
higher strength-to-weight ratio
than existing iron-base alloys**

New General Electric vacuum-melted alloy J-1300 is specially designed for large forgings, such as turbine wheels, rings, shafts, and buckets. It has the highest strength-to-weight ratio of any iron-base alloy in the 1300° F range.

Its rupture strength at 1300° F is comparable to that of other iron-base alloys at 1200° F. Its minimum guaranteed tensile strength at 1300° F is 135,000 psi.

In addition to its greater strength, J-1300 is more ductile — making it easy to forge. And its improved properties are easy to control and maintain during forging.

G-E alloy J-1300 is currently available in billets and bars. Substantial quantities have been made, and guaranteed minimum specifications are available. For complete technical data, write for Bulletin 796-394, Metallurgical Products Department of General Electric Company, 11101 E. 8 Mile Street, Detroit 32, Michigan.

PROPERTIES OF J-1300

Tensile strength at 1300° F

Ultimate — 135,000 psi

2% yield — 102,000 psi

Elongation — 12%

Reduction of area — 12%

Rupture strength at 1300° F

65,000 psi — 1 hr, 24 hours



At Temco
past performance
is the best index to
future achievement

At Temco, more than a decade of planned progress has resulted in an accumulation of know-how and productive capacity that makes Temco's capabilities complete from basic design to precision production.

During these years of growth, Temco's skills and specialized equipment have been applied to the completion of projects that included such diversified operations as electronic and guidance systems, complete aircraft, missiles and weapons systems, landing equipment, turbine engine components, and the design and production of major components for almost every leading U.S. aircraft manufacturer.

Temco's accomplishments in the future will reflect the experience gained in past performance. If your business is with anything that flies, look to Temco for complete capability and reliability from development through production.



AIRCRAFT CORPORATION • Dallas, Texas

Progress Is Our Most Important Product

GENERAL  ELECTRIC



KEEPING INSTRUMENTATION A STEP AHEAD OF SPEED

AVIONICS IN ACTION AT BUNROUGHS:
FROM RESEARCH AND DEVELOPMENT
TO PRECISION MASS PRODUCTION

Today's dramatic new developments in overall performance demand equally dramatic new developments in flight instrumentation. And Burroughs is assuming ever greater responsibility in the field through its work in the broad new sphere of avionics.

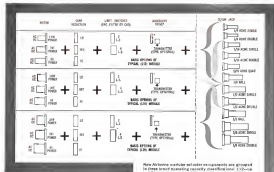
Example 7: Past experience In mass production of test instruments as ultrasonic, accelerometers and gyros. Plus of course, extensive research and development in totally new concepts of flight instrumentation. And it is all these integrators, reliably, consistently beyond our performance.

We have, too, the capabilities and facilities for further research and development in this fast-moving field. And in all areas of our proved responsibility and competence—not only instrumentation but control systems, electronic computation, communications, data processing and others—we stand ready to see that your needs are met. We're not just a company; we're a way of life. We're the way to the future.

Write, call or visit Burroughs Corporation, Defense Contracts Organization, Detroit 32, Michigan. Or Burroughs Defense District Offices: Forti, Pa. • Dayton, Ohio, 2895 Linden Ave. • Irvine, Calif. 10075 Venture Mall • Washington, D.C. 1220 H St. N.W.



THE FOREBODING NAME IN COMPUTATION



New Achroma modules include components are grouped in three broad mounting capacity classifications: 1/2" up to 300 g; 1/4" up to 7500 g; 1/8" up to 3500 g.

FROM THESE BASIC AIRBORNE COMPONENTS YOU CAN SPECIFY
OVER 300 DIFFERENT ACTUATOR PACKAGES

New Airborne modular actuators give you more design freedom, help eliminate costly specials

With Airborne's new modular actuators you are no longer limited to a line art, say, a dome standard models which design is relatively fixed. Instead you can now specify any one of several hundred different actuator packages assembled from modularized, interchangeable Airborne components. In 90% of the cases this will give you a linear actuator exactly meeting your capacity and configuration requirements. You enjoy greater design freedom and reduce the expense and delay associated with speciality. Write today for full information.



Diagrammed translation shows how Antisense module editor can be expanded from via 3' 5' controlled list of standardised, interchangeable parts. With several hundred combinations, precise post target proteins are identified and searched as mass annotated.

LINEATOR® • ROTORACK® • TRIM TROL® • ROTABETTER® • ANGLEBIRD®



AIRBORNE ACCESSORIES CORPORATION

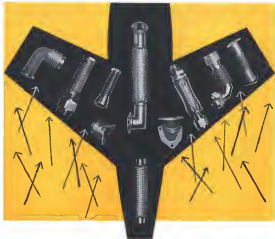
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RESULTS

NEW MODULAR ACTUATOR CATALOG E7A
 From the control design circuit, power supply to standby system to the cost effective standby digital unit, including complete dimensional data. Write for a copy today.



SYLPHON® BELLOWS FLEXIBLE CONNECTORS simplify design and operation of STRESS-LOADED AIRCRAFT COMPONENTS

Fulton Sylphon, STAINLESS STEEL, connectors possess enormous built-in fatigue resistance. They stubbornly withstand high temperature and pressure stresses, vibration, pulsation and shock conditions, constant flexing and the corrosive action of synthetic lubricants and aviation gases.

These versatile connectors are available, in specifications, in numerous shapes and sizes to connect shafts, pipes, misaligned and/or shifting terminals. Single or multiple ply types . . . and heat-treated construction,

when indicated, to effect various abrasive and heavy-pressure conditions.

Sylphon Bellows Flexible Connectors are made by America's foremost manufacturer of bellows and bellows assemblies for innumerable applications. Engineering skills and production know-how are rooted in 52 years of specialized experience in this field.

For complete design and ordering data, send for Engineering Bulletin 1400-S.S.



Robertshaw-Fulton
CONTROLS COMPANY

• FULTON SYLPHON DIVISION
Knoxville 1, Tenn.



Getting specific about gravity!

Falling apples fascinated Sir Isaac Newton. No doubt he enjoyed a few of them while deriving his famous gravitational formulas. Newton's concern was with what came down, whereas aviation engineers today are primarily concerned with what goes up. Even so, the gravitational challenge is the same.

A jet plane, intercontinental missile—or anything that moves—usually leaves the design stage too heavy for optimum performance. To be specific—the specific gravity of the material of construction is too high.

Now, with Titanium, the design engineer can cap-

ture the strength of alloy steel at barely more than half the weight. What's more, Titanium is unaffected by most corrosives . . . and is impervious to the deadly attack of sea water and marine atmospheres. Its coefficient of expansion is low . . . and it can withstand long-term operating temperatures as high as 1200°F.

All types of Titanium mill products, from foil to seamless tubing, are made by TMCA. With production going up and prices going down, now is a good time to design with Titanium. Titanium literature on Titanium is available just by writing.

... FIRST IN **Titanium**



TITANIUM METALS CORPORATION OF AMERICA, 233 Broadway, New York 7, N.Y.



Another famous plane PROVEN IN SERVICE

1929

For the first time in complete "load" flight, a Rockwell biplane, the A. Sperry Gyro Biplane and Gyroplane, is used in a Catalina ATC over a 15-mile circuit.

For introduction of these aircraft, Rockwell is a leader in producing together with several industries of the world. Rockwell's extensive experience in all and one for the "Rockwell" series.

ROCKBESTOS PRODUCTS CORPORATION

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NEW HAVEN 4, CONNECTICUT
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HOT PARTS FOR SPACE-AGE SPEEDS

Heat is the greatest single barrier blocking higher speeds for America's air and space craft. Not only the heat of air-friction, but the withering heat that seethes inside the mighty engines of the space age. Before our manned and unmanned aircraft can fly faster—in the atmosphere or out of it—power plants must be built whose components function with precision even in this mortal-melting heat.

Ryan Aeronautical Company is breaking the heat barrier in the lab and on the produc-

tion line. Through intensive metallurgical research, Ryan learns the inner secrets of the world's newest high-temperature alloys. And in the factory, Ryan puts this vital knowledge to work—shaping super metals into precision hot parts for all types of rockets, ramjets and turbojets.

Whether it's a single specialized component or a complete propulsion system, Ryan has the skill, facilities, and experience to handle it—from R&D through quantity manufacture.

RYAN BUILDS BETTER

AIRCRAFT • POWER PLANTS • COMPONENTS

Ryan Aeronautical Company, San Diego, Calif.

CASE DRAIN PORT (S)

VARIABLE DISPLACEMENT AXIAL PISTON PUMP

CONSTANT POWER CONTROL

MOTOR COOLING OIL TO PUMP CASE DRAIN PORT (K)

PRESSURE PORT

OIL FROM RESERVOIR

SUPERCHARGING CENTRIFUGAL PUMP

SUPERCHARGED OIL TO MOTOR COOLING COOLING OIL PASSAGE

REDUCTION GEARING

ELECTRIC MOTOR

89



On the threshold of a frightening yet fascinating new age, The Kaman Aircraft Corporation would like to express its gratitude to and confidence in the only nation in the world which is truly a government of, by and for the people. To all who are working to keep it that way warmest greetings of the season and heartfelt wishes for a prosperous and peaceful new year.

THE **KAMAN** AIRCRAFT CORPORATION
BLOOMFIELD, CONNECTICUT

WHO'S WHERE

In the Front Office

Pete Cohen, a director and a member of the executive committee, **Sermacham, Inc.**, New York, N. Y.

Dwight E. R. Boland, a director, **Sys Data Corp.**, Gales, Ill.

Edward R. Feltz, president, **Tube Reeling Corp.**, Wallingford, N. J.

Frank G. O. Naffelt, USNR, jet's president, **North American Instrument**, Englewood Cliffs, N. J.

Robert H. Kohn, vice president, **General Electric**, Schenectady, N. Y.

Charles F. Schmitt, production superintendent, **General Electric**, Schenectady, N. Y.

Richard R. Feltz, executive vice president, **Transamerica Corporation**, San Francisco, Calif.

North American Aviation, Inc., Los Angeles, Calif.

John R. Feltz, executive vice president, **General Electric**, Schenectady, N. Y.

Joseph E. Dugan, vice president, **General Electric**, Schenectady, N. Y.

William E. Dugan, vice president, **General Electric**, Schenectady, N. Y.

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William E. Dugan, vice president, **General Electric**, Schenectady, N. Y.

INDUSTRY OBSERVER

Ignition In Polym that ballistics missile occurs while the Navy Lockheed missile floats low in the water. Missile can be ejected from a surface vessel or submarine by a torpedo motor first stage or launch. (dropped) contained with ballistics missile in its firing position. Firing will take place a safe distance from the ship and would be programmed to launch the missile into a vertical strike. Vertical strike-on-surface (VSS) planned for a small vessel in five minutes or hours after launch. This would prevent enemy from retreating the trajectory of the missile to find launching vessel.

Guidance by USAF Douglas Thor intermediate range ballistic missile will control reliability of self-contained inertial guidance system made by A.C. Spark Plug. Backup program for ground-based radio command guidance being developed by Bell Telephone Laboratories will be dropped. The decision stems from improved reliability and accuracy was obtainable with inertial guidance. Army's Jupiter IRBM also employs self-contained inertial guidance only. Firing schedule at Polaris AFB, Ill., for Thor includes two launches the month for further checkout of guidance system and another firing in January of complete missile with one case.

Acad reflecting tests involving General's B-58 supersonic bomber and Boeing KC-119 jet trainer have shown an excellent compatibility between the two aircraft and confirm the range potential originally envisioned for the B-58.

Phasing Smeets Research at A. V. Roe Canada Ltd., Mississauga, Ontario, is still being supported by USAF Air Research and Development Command. Details of smelter configuration had down a few years ago at Avro have been modified and refined.

Joseph T. McNamara, president of Convair Division of General Dynamics Corp., will retire Jan. 1 and will be succeeded in this position by J. V. Nisk, new executive vice president of Convair.

Length of cargo compartment in Russia's new MiG-6 twin-engine helicopter which has a 32-foot payload (AW Nov. 11, p. 50) is approximately 35 ft. Shorter sources say helicopter's overall length is "approximately the same as for two million passenger cars"—40-45 ft. MiG-6 has carried 35,400 lb. payload to altitude of 7,575 ft. within 11 minutes after takeoff.

Naval has deferred consideration of order for Convair P-3V amphibious aircraft until Fiscal 1958. Navy was losing heavily through ordering ASW version of Lockheed Electra helicopter transport.

None comes by Thor intermediate range ballistic missile and Convair's Atlas ultraminiature ballistic missile on being manufactured by General Electric's Missile and Guidance Systems Department in Philadelphia, while the new core for Navy's Polaris ballistics missile is being handled by the company's Chemical and Metallurgical Products Department in Pittsfield, Mass.

Secrets may be shielding the engine tail pipes and intakes of their jet locations in an effort to reduce vulnerability to infrared-guided missiles.

First flight of A. V. Roe Canada Ltd.'s CF-105 Arrow (AW Oct. 21, p. 50) probably will be made in January following completion of the interceptor's two trials.

North American Aviation's Columbia division is scheduling the roll-out of its new E-3B-1A-1000 jet trainer for late this month. First flight of the basic trainer, powered by a Westinghouse J34, is planned for late next month or early February.

Both Thor and Jupiter IRBMs are designed for adoption to mobile launchers for firing.

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'Window Dressing' for Sputnik

Current opinion of some knowledgeable military and industry people involved in the missile program is that the situation is going to get worse before it gets better. "Window dressing" is the label most frequently put on news of the past few weeks intended to quiet the program, back battleships, get the DBMs sold. These attitudes were evident two or three weeks before Democratic voters indicated last week with a change that the Eisenhower Administration still lacks no sense of urgency despite the success of Soviet Sputniks (see page 15).

Major disappointment to the Air Force is William M. Hallock, Defense director of guided missiles, who still doesn't see signs of clarifying the program in jet liquid and Thor into production. Chief program and chief decision-making are in no greater shape than when Trevor Gardner quit as USAF Assistant Secretary for Research & Development.

Overlooked from a high-ranking officer "This trouble is not as bad as it seems. I guess it won't last long, but we will suffer for it in five years."

Appearing before the Senate Preparedness Subcommittee, Defense Secretary Neil H. McElroy agreed under repeated questioning that Hallock has only "coordinated" and not "directed" efforts, and that the authority of Dr. James R. Killian, the President's science adviser, is only advisory.

Interesting sidelight is that the man who has won most respect from USAF and others for his objectivity and intellectual honesty is an Army officer: Maj. Gen. A. W. Bennett, Hallock's military executive assistant.

Pentagon Fears

No one has mentioned it out loud, but one of the major reasons behind the Pentagon confusion is the possibility that the Defense Department will lose its Ministry of Supply amongst as packaged in the British. First step, since very much more has, will be the choice of a single manager for air and advanced weapon systems even if it is only for development.

On top of that, Defense Secretary Neil H. McElroy says he would like to see more research and development funds for the Defense Department itself along with more flexibility as the application of funds. U.S. military men are concerned that the British system, where a separate minister picks out the goods and funds it is the using, is a poor one.

Another major possibility is that McElroy will consider a revision of the rules and missions of the armed services. He told the Senate Preparedness Subcommittee that the Army wants to develop a 50,000-man version of its Redstone missile. Former Defense Secretary Charles E. Wilson a year ago shifted operational use of all but the DBMs to the Air Force and limited Army to a 20,000-man force for ballistic missiles. If Army is allowed to develop the long-range missile, McElroy said, the Joint Chiefs might then be asked to reconsider the cap. Army is optimistic about this change as well as its increase in the weight limitations on its missile.

Science Advisory Shift

Science Advisory Committee will be transferred from the Office of Defense Mobilization to work directly with the White House and James R. Killian, Jr., President

Washington Roundup

Each other's new special meeting for science and technology. Five new members also were added to the new committee, boosting the total membership to 19. New members are James H. Doolittle, chairman of the National Advisory Committee for Aeronautics; Dr. R. F. Bacher, Columbia Institute of Technology; Dr. E. M. Pottel, Naval Academy; Harvard University; Dr. Herbert York, University of California; and Dr. George B. Kistiakowski, Harvard University.

Military Pay Push

The Administration has finally decided to push vigorously the Gordiner plan for an "incentive" type military pay system, but it faces strong opposition in the Congress. The plan, designed to reward skill and merit and help the military retain hard-to-find technicians, was worked out by a Defense Department review committee headed by Ralph J. Gordiner, president of General Electric Co. (AW 12 p. 17).

Sen. John Stennis (D-Miss.), chairman of the Senate Armed Services Subcommittee examining the proposal, declared "I have never known one single proposal to have as much said about it with as few supporting facts as this."

Saying that the Gordiner system has been recognized as a necessary to give incentive pay, Stennis is keeping such a questionnaire in, sent to the Defense Department in July to obtain "some proof" of the results of the Gordiner plan has never been answered.

Perennial Debate

Perennial talk without any action over a site for a second airport to relieve Washington's crowded National Airport moved into the public hearing stage last week with Presidential Assistant Edward Gurnea presiding. Gurnea also chairman of the Airway Modernization Board, has until Jan. 15 to decide which of four possible sites he will recommend to Congress in the form of the proposed report.

Meanwhile it is difficult, opposing Baltimore's Friendship Airport and has suggested the construction of a second airport site between its field and Washington. Virginia's air fields split over the location of an airport on the three remaining sites, all of which are located on the Virginia side of the Potomac. The Washington Board of Trade is backing Dulles, Va., as the most convenient location; a steel mill taken several years ago by airlines operating into the area.

Industry Summons?

Senate Preparedness Subcommittee gave summons (see inside) contractors to Washington to get their views on just how and when the U. S. will build the 50,000-ton in the technological era and what should be done about the submarine, headed by Sen. Lyndon Johnson (D-Tex.), already has based from testing aircraft and top Defense Department officials as its investigation of the U. S. defense effort. Final decision as to whether to ask the contractors in Washington will depend upon the results of a questionnaire the subcommittee is now circulating among the manufacturers.

—Washington Staff

Army Partisans Rap Aircraft Industry

Memorandum declares automobile industry fattered mass production and could best produce IRBMs.

By Claude White

Washington—Victims in this long fight to have the annual-developed Jupiter intermediate range ballistic missile ordered into production (see page 27), U.S. Army partisans are now preparing to prove that the automobile industry is the true father of mass production methods used in the missile industry and can not produce the missile industry in missile.

In addition, there are definite indications that Army is determined not to encourage the Air Force on other fronts, starting with the anti-missile missile and rushing into the area of space satellites, manned and unmanned.

Senior Army spokesmen, however, are talking about an anti-satellite satellite. Tentatively called the Barn project, it would be capable of leaving its own orbit to destroy another satellite launched by an enemy power.

Rough outline of the Army approach on the subject of mass production is contained in an anti-officer memorandum brought to the attention of Averett White. The document indicates it was prepared in Army's Office of Public Information.

"Modernization of missile construction," the memo says, "is actually accomplished by the auto industry."

The prime contractor for the Jupiter is the Chrysler Corp., an automobile industry firm, with the problems of mass production in mind. It is pointed out that it is not possible to produce a missile in a mass production plant, they note, but that automobile auto industry is opposed to airplane industry methods of construction.

This should provide a cheaper end-product available at a greater rate than that which the missile industry can do.

The memorandum indicates that Maj. Gen. H. P. Sharke, chief of Army public information has been "upset" in news stories disclosing the Jupiter system approach to IRBM design as applied by the TWA by Douglas Aircraft Corp.

Simultaneous development of a production line and support equipment so that the weapon can be quickly moved into production may mean to say when it is delivered has been discontinued. That under management of USAF's Redstone Missile Division, Dayton, along with training and logistic support, can be expanded rapidly with production under way (AW Dec. 2, p. 26).

The Army memo says Gen. Sharke is convinced "various engineering studies on 'Just in production,' growing out of the five-year-old Jupiter System Concept, have been 'looked.' To affect their effect, the memo calls for data on 'one most significant production technique on Jupiter'."

In addition, the Army author makes these observations:

"I would like to see that it can be in the 2-3 months time a short piece of collecting at the time which will be doing the three that mass production is used by the airplane industry in not continuous (or) with the public conception of mass production."

The public, when you say mass production, visualize a continuous system which begins with a piece of metal at one end and people standing around taking small parts and the final result is that the finished job pops out at the other end.

This is, in fact, not true.

"Mass production by the airplane industry is very similar to the so-called hand production carried out at Ford since. In other words, a portion of the work is put on a dial and the assembly is moved to another dial attached to the main frame. There is no conveyor system and there is no assembly line."

Photograph of the Douglas Thor missile, shown in the Pentagon and are being held from public release as noted from Donald A. Quarles, Deputy Secretary of Defense.

The document calls for written material explaining the claim that there is no assembly line in a modern aircraft factory. In addition, it asks for emphasis on the Army position that "if not, the automobile industry

to introduce mass production into the Air Force."

The document adds that, "prior to the construction of the Willow Run plant by Ford, and the Douglas Engine Plant in Kansas and the Douglas Motors Assembly Plant in Madison, there was no such thing as mass production even as the airplane industry was the same today."

Aircraft industry spokesmen quickly pointed out that mass aircraft plants including that of Douglas, do have moving line similar to those on auto plants. This has been true since World War II and, during that war, production lines and equipment which helped aircraft companies were used to help auto firms learn to build aircraft.

This was true in the case of aircraft-Correllville Vultee and Douglas repeated the same story and the Ford line at Willow Run and in the construction of aircraft engines by auto makers. The Ford line for building aircraft engines during the war was established by Ford by Ford & Whitely.

Automobile mass-produced automobile assembly methods are similar with the major exception that the aircraft industry works to reach closer tolerances, assemblies must be more precise, and there must be provisions for incorporating design changes on the line. The Army memo laid down concepts that have been made evident in part of that sector's doctrine for several months.

Mass assembly of the Army effort to present the concept of development by its aircraft have been in connection with future work in the missile and satellite field.

Defense Secretary Neil H. McMillan responded to make a new big step towards to take change as a single example of future airplane development. His first project in this effort will be the anti-missile missile in a field in which both Army and USAF are working.

Army partisans need no secret of these solutions to have Redstone Arsenal become a key contributor to projects carried out in the new missile program, and there are reports that they expect to get the nod from McMillan's supporters. After the anti-missile missile the single manager will move into other areas, including space satellites.

Army spokesmen repeatedly claim that this McMillan, still in development, will be able to help defend the U.S. against all enemy attack.

USAF Chief of Staff General Thomas D. White, on the other hand, says the Air Force "Wants, it still is 'in progress.' The Air Force staff are finally there are some things we don't quite know how to do."

What U.S. Has Done Since Sputnik

Washington-Sputnik II, which publicly highlighted the Soviet Union's technological leadership, was just into orbit two months ago. Following is a chronological list of the steps consumed by the U.S. since then.

- New satellite program for the Polaris fleet ballistic missile, which Lockheed is selling a million contract to accelerate development (AW Oct. 26, p. 10).
- Project Fiasco, sponsored by Air Force Office of Scientific Research relies on new suspension after being derailed by lack of funds. At least one and probably two of the satellites are believed to have crashed the 4,000 mi. long detour (AW Oct. 26, p. 31).
- Defense Secretary Neil McMillan cosigned two economy orders of his predecessor, Charles E. Wilson, restoring large amounts of money to the levels authorized by Congress and providing for additional 1400 million in the fiscal year—5200 million of this in USAF—aid production and government (AW Nov. 4, p. 28, Nov. 11, p. 32).
- McMillan names defense secretary Douglas DeLoach to replace him in his own day, starting in early January, preliminary approach that would have disposed of some General but, close upon the accident industry (AW Nov. 4, p. 26).
- President Eisenhower named Dr. James H. Doolittle, president of Manufacturers Institute of Technology, his special assistant on the science and technology to oversee the U.S. science program (AW Nov. 4, p. 32).
- Secretary McMillan tells Army it is now possible to the satellite program by attempting to launch a vehicle with its Jupiter C three-stage rocket missile (AW Nov. 18, p. 27).

• Single manager for growth and development on weapon systems is announced by Secretary McMillan, who says the anti-missile missile will be the new staff's first project (AW Nov. 25, p. 26).

- The single manager for growth and development on weapon systems is announced by Secretary McMillan, who says the anti-missile missile will be the new staff's first project (AW Nov. 25, p. 26).
- USAF Maj. Gen. Donald A. Quarles is named single manager for missile aircraft and nuclear powered missile program in Defense Department and Atomic Energy Commission (AW Nov. 25, p. 31).
- Both USAF and Army Jupiter intermediate range ballistic missiles are ordered into production by Secretary McMillan, who says in IRBM operational capability can be achieved in the United Kingdom by the end of 1958 (AW Dec. 2, p. 26).
- Senate Permanent Subcommittee headed by majority leader Lyndon Johnson (D-Tex.) begins investigation of U.S. defense effort with emphasis upon America's lag in the ballistic missile field (AW Dec. 2, p. 31).

Other congressional committees are making preliminary study of the defense program.

• President Eisenhower orders Science Advisory Commission transferred from the Office of Defense Mobilization to the White House, adds five new members to the committee.

• An Air Force transfer of the 14th, Division to the Strategic Air Command from ARDC's Ballistic Missile Division, transfer the second stage of the Jupiter C missile to the assembly plant at both the KSCB and IRBM to SAC and order that season of San Bernardino, Calif., Air Materiel Area to support the effort.

New Funds Needed for IRBM Production

Washington—An emergency to supplement appropriation of about \$100 million is needed in the final year to begin production of both the Army Jupiter and USAF Douglas Thor intermediate range ballistic missiles.

A week after the scheduled for production of both weapons was used by future airplane development. His first project in this effort will be the anti-missile missile in a field in which both Army and USAF are working.

Army partisans need no secret of these solutions to have Redstone Arsenal become a key contributor to projects carried out in the new missile program, and there are reports that they expect to get the nod from McMillan's supporters. After the anti-missile missile the single manager will move into other areas, including space satellites.

Army spokesmen repeatedly claim that this McMillan, still in development, will be able to help defend the U.S. against all enemy attack.

USAF Chief of Staff General Thomas D. White, on the other hand, says the Air Force "Wants, it still is 'in progress.' The Air Force staff are finally there are some things we don't quite know how to do."

Aircraft Co. are not going to be used to full capacity. The contractor will produce at the rate set by Helovet but is capable of producing at a much faster rate without being on a second stage of the Jupiter C missile.

Cost estimates per satellite vary widely. Figures suggested by one Pentagon expert indicate that the cost of a single Thor will be about \$100,000, that of a Jupiter over to \$1.5 million. This means that, for the price of one Thor and one Jupiter, the Douglas Thor could be built in 15 Thors if a single Thor were in production.

No contract has been awarded for the Jupiter Army expenditure estimate. Chrysler Corp. will make the missile at its plant in Detroit where the last for the Redstone missile is now operating. The company was reportedly confident a production rate of 10 a month can be reached in 12 to 18 months.

In contrast to other estimates, Army spokesmen on Jupiter will be cheaper than Thor. They argue that much of the development cost is absorbed in the Redstone missile project, that the final Jupiter will require less modification than the USAF counterpart and

that the Army is more experienced in dealing with missile cost estimates.

It was clear from talking to military missile experts that the Douglas Thor pointed decision to make both missiles was largely based on interrelated political considerations and that it was going to bring the real costs.

In fact, there is a strong possibility it will incur further competition among the USAF.

USAF Chief of Staff Thomas D. White has said that launch of the second forces has no time for evidence. More while, there is strong evidence that the Army has been support at high levels in the Defense Department.

One example is the fact that these are photographs available of the Douglas Thor production line as operation and that have been seen in properly cleared military and civilian officials. They have not been allowed for outside publication on direct orders from Donald A. Quarles, Deputy Secretary of Defense and former Secretary of the Air Force.

The status of Jupiter has been changed with the new Charles E. Wilson, McMillan's predecessor, called a halt to Army funding for the project and is

Plato Continues

Plato, the Army-sponsored anti-missile missile study program being conducted by Scripps, has secured credit approval support. The program was scheduled to continue in the spring of 1958.

Plato is method of producing a satellite which would enable defense system to detect missile U.S. satellites over sea area which by Soviet atmosphere range ballistic missile. With an extended capability space cluster range missile. Plato would provide little on missile defense. Scripps contract is with Redstone Arsenal.

assured that development would be continued only as a backup for the Air Force's T-38.

Halliday was reported to be "determined" that T-38s be produced despite arguments on cost, speed of earth-orbiting capabilities and the problems of separate training and ground support needed for each of the versions.

Some of the equipment is common to both systems, particularly in the area of fuels. Both models use a North American/Rocketdyne engine. On the other hand, there are a large number of test and ground equipment items that are peculiar to each missile, particularly carrying the "big gun" or the ground launchers, launchers, etc.

Overall, the cost of providing initial equipment of an intermediate stage ballistic missile system in USAF will be about as high as that of a modern jet intercepter or bomber equivalent. While the unit cost of the missile is considerably lower than that of the manned aircraft, support equipment charges are steep. It is responsible to see ongoing launch facilities, launchers and other items built for cost-effective airplane operations.

For the T-38, the Air Force has been working since the start of development with its warlike air development support (AWD) Aug. 25, p. 30). Top responsibility has been given to industry. Control of the program for the T-38s has been given to the SMC Bendheim, Calif., depot of the Air Material Command.

Under development at San Bernardino is a new electronic data processing center which will be connected in high-speed communications with all other USAF headquarters, industrial suppliers and the launching sites. The system will be in operation by mid-1978.

USAF also has been modifying Douglas C-130 transports as delivery vehicles for the A-10 and T-38 aircrafts/bombers/battle missiles.

Brig. Gen. B. J. Fink, AWC Ballistic Missile Manager, is in charge of contracts for the Air Force on the T-38 program.

New Grammar Contracts Exceed \$86 Million

Newly awarded Grammar Aircraft Packaging Corp. two follow-on contracts for additional quantities of WF 2 Trainer and F-16B aircraft totaling more than \$86 million last week. Aircraft for the Trainer was capable of carrying three missiles and one external pod, and the F-16B, that for the Cougar totaled about \$40 million and exceeds F-16B total sales 1979.

New contracts would not necessarily increase of parent work force. Grammar was pointed out.

USAF Stakes Spacecraft Claim

Washington—Along with the assignment of its first ballistic missile project to the Strategic Air Command, USAF also moved today that it could be the most part of its evolution in national missile, rockets and spacecraft as a single instrument for performance of its mission.

Gen. Thomas D. White, USAF chief of staff, shifted the 1st Missile Division to SAC from the Ballistic Missile Division of the Air Research and Development Command. With it, SAC was given the initial operational capabilities of both the intercontinental and intermediate range ballistic missile programs.

Flexibility Essential

Adding another 45 years of a Defense Department decision to start production of both the USAF Thor and Atlas launchers (AWD Dec. 2, p. 30), Gen. White emphasized that growth about the use of ballistic missile launchers.

• **Flexibility** must be an inherent characteristic of the weapons, adding it mandatory for USAF to have alternate delivery vehicles operational at all times.

• **Adaptability** must be inherent in the weapons and can operate in the atmosphere or beyond it. USAF will use the best tool for the job.

• **USAF** looks upon all three instruments—aircraft, rockets and space ships—as "compatible and complementary" and parts of a "functionally complete system."

Both the Army and Navy are expected to perform their missions, Gen. White said, but only USAF can deal with the future.

Gen. Gavin Stresses Space

New York—Gen. Gavin, military order space, is the pace of control for the U.S. 1st Air Force, Army Chief of Research and Development, said last week. Agreeing with a statement made recently by Dr. Edward Teller, he said that the missile that controls space will control the future of the human race.

Speaking at the Annual Progression Meeting of the American Overseas News here where he is in charge "United Nations," he warned that the nation must face the threat of foreign enemies in the Communist, probably by a series of "small wars" because that was with its catastrophic destruction on each side could not even begin to begin.

Because control of space, including outer space, is a prerequisite to the control of land, Soviet progress in ICBMs and the launching of satellites have indicated a shift in military power, he warned. In the future, additional satellites will be launched soon, with a satellite reconnaissance capability. This capacity, matched to an ICBM, satellites, he said, will bring it in to its use of long-range control in the sky, under a wing of the U.S. 1st Air Force, he said.

Gen. Gavin stressed that an effective defense is not essential because of the ability of the country to wage a limited war. He said that for specific work such as a manned space, an unmanned mission, or SAC has, 1969 effective air defense is possible.

In the future, he said, when a nation desires to defend a specific site it could provide an air defense in effective that it would not have the cost to an attacker to make a direct attack on it. This he termed a 100% effective defense.

Factor limiting the use of ICBMs, Gen. White told the National Press Club, is the requirement for precise data on the location of the target and its relation geographically to the launching area.

In addition, he said, there is the inability to reach an intermediate ballistic missile or divert it to another target once it is launched.

For this reason, he said, the Strategic Air Command must be able to assign its attack vehicles target values and the national defense call for a change in tactics as strategy.

Gen. White's shift of the 1st Missile Division to SAC, the using command, will share some difficulties for both peace and subsistence countries involved in missile control programming. The contractors in the past have been more or less forbidden to communicate with SAC except through Air Research and Development Command.

Operational Capability

The move is expected to speed development of operational capability. Although the 1st Missile Division already has been equipped for training at Cooke AFB, Lampas, Calif.

Gen. White also confirmed that the San Bernardino, Calif., Air Materiel Area will provide logistic support for the ballistic missile program (AWD Aug. 28, p. 20). In USAF terminology, that means the San Bernardino ASMA is approved mission system. Support Manager (WSSM) for all ballistic missiles. It will control the flow of support.

and maintenance facilities with the exception of power plants and workhous.

Other points made by Gen. White:

- **USAF** is determined to improve its training and control system to facilitate defense against enemy missile attack.

- **Event desirable** as a defense, a "last ditch" effort, is to fight the enemy alone he gets over the target area. The Air Force aims to keep the enemy from getting off the ground.

- **USAF** is determined to test the capability to control space, because it will result in control of the Earth's surface.
- **Gen. White** did not concede that Russia can develop SAC bases in Europe with its ICBMs.

- **Automatic missile** problems call for a major technological effort and there are some things "we don't quite know how to do."

Ramo-Woodbridge Lab Separates Functions

Los Angeles—Recent action of Ramo-Woodbridge Corp. in setting up new Space Technology Laboratories (AWD Dec. 2, p. 25) is an organizational change intended to separate further the company's Air Force ballistic missile systems engineering functions from its growing defense and industrial electronics activities, according to Dr. Dana Woodbridge, company president.

Space Technology Laboratories will devote their full efforts to USAF ballistic missile program technical problems, a responsibility previously assigned to Ramo-Woodbridge's guided missile division. Dr. Dana Woodbridge, who has directed the majority of his time to the ballistic missile program since 1964, has duties as executive vice president and secretary of the parent corporation to become president of the new laboratory. Dr. Louis G. Dana moves over to the new division to become executive vice president and general manager, while Dr. Richard P. Nelson becomes vice president and assistant general manager.

New laboratories will have their own administrative and technical supporting facilities, instead of sharing them with the parent company as in the past. Dr. Woodbridge says. Company personnel previously assigned to the USAF ballistic missile program will be transferred to the new division.

Contract to industry agencies, the newly created division does not alter unaltered Ramo-Woodbridge policy not to take missile program contracts. Dr. Woodbridge says. Nor does it alter long-standing policies established when the company took on ballistic missile systems and guidance responsibilities which exclude the firm from manufacturing systems or equipment for any of the USAF ballistic missiles.

USAF Full Pressure Space Suit Is Light, Permits Free Movement

Washington—Breakthrough in pressure suit development has for the first time given USAF a pressure suit that is not only capable of protecting men in both high altitude and space flight. One version will be worn by Scott Crossfield for his flight in the X-15 rocket research aircraft.

Breakthrough in successful development by David Clark Co. of Worcester, Mass. and Air Research and Development Command of a "zip-lip" suit which allows a person to "zip" into it, but still allows the pilot good freedom of movement and relative comfort.

Cost of this portion of a 13-year USAF Navy pressure suit program is \$169,900 to \$151,000. Work on this version has been under way for about 24 years and the X-15 suit is one of four similar prototypes.

Suit can be donned by the pilot himself in 12 minutes. He needs help with his helmet but the rest of the specialized module can be donned in five minutes, but that can be handled by one man.

Five-hour suit weighs about 13 lb. and a new look containing emergency oxygen and pressure systems weighs approximately 11 lb. Brig. Gen. Don Farley, director of human factors at the ARLC headquarters, called both the suit and the pilot "impressive, more breakthrough in test development."

Pressure full pressure suits have weighed closer to 100 lb. and have contained as many as nine sealed d-rings at body points to allow freedom of movement. Some suit incorporates only one d-ring between the top of the suit and the helmet. This is the suit's only point of vertical-to-horizantal control.

Suit has been given vital pressure and impact factor tests on accident slots and has been adequate tested to 175,000 ft., the upper limit of Wright Air Development Center's chamber. Heat tests have been run for 150° and wind tunnel tests have been made up to 650 ft. at an level pressure.

Five feet air lightweight long to decrease in altitude against outside wind resistance present through which air is pumped to cool the pilot, negatively static, the dipstick or "kilt suit" garment together with the pressure container, which is suspension system, and an illuminated outer garment to protect the helmet against snagging and protect from heat.

Equivalent pressure inside the suit is 23,000 ft. Crossfield will fly the USAF North American Aviation, Inc.,

research plane at speeds in the Mach 5 range and at altitudes in or above 250,000 ft.

Gen. Crossfield said that the suit is in the group now nearing completion of development, including the X-15 suit itself, are fully capable of use in space flight.



SCOTT CROSSFIELD, NASA pilot who will fly the X-15, models USAF's new lightweight full pressure suit. New design will later follow development from through.

U. S. Scientists Fear Makeshifts in Space

New York—Fearing that U. S. may postpone its future in attempting to reach Russian space achievements over the next three years with makeshift measures, delegates to the American Rocket Society's 12th annual meeting here last week only a long-range, comprehensive program will meet the continuing challenges of space, delegates felt.

American Rocket Society has factions prepared to see the White House's national space flight program across passing scientific, psychological and economic regulations, and has pre-

pared creation of an independent agency to handle all except the military aspects.

The American Rocket Society proposed, written before Sputnik I was launched, is considered as a mature analysis of the scope of effort necessary to insure eventual leadership in the continuing challenges of space, delegates felt.

Society's Four

Broadest representation of the program in that its authors who represent a wide range of weapons development activities, feel the government does not

yet appreciate the present situation or recognize the threats and promises of the future.

More direct and practical concern to society members was the fear that their next few years might be spent in hammering together stop-gap studies aimed at duplicating immediate Russian achievements rather than working on projects with more military and civilian potential.

"These policy themes completely overshadowed panel meetings and individual papers covering technical aspects of space flight that would have been of much greater interest for rocketry specialists."

Copies were sent to the White House eight weeks ago with a covering letter from Capt. Robert C. Truax, outgoing president of the society and deputy director of USAR's Ballistic Missile Division in charge. Paul Pipes, space network satellite (AWF Oct. 14, p. 28).

Copies also went to Dr. James R. Killam, Jr., President Eisenhower's science advisor; the President's Scientific Advisory Committee; National Security Council; State and Defense Departments; Central Intelligence Agency; National Science Foundation; Space Programs; for engaging, before, after, and in half dozen other government agencies as officials.

Considered Truax and no official reaction to the American Rocket Society, it is pointed out by the society, but unofficially the Society has had indications that Washington considers its plan "in for the most complete, comprehensive and well-founded" that has been offered to date.

Most others have been for individual projects or series of projects.

Considered Conservatives

The Society's plan, calling for manned satellites and manned orbital flight as far out as Venus and Mars over a 20-to-25 year period, is considered conservative by some of its authors to be conservative in the light of present capabilities and what Keith Eldridge called a number of close-athand breakthroughs in present technical areas. Eldridge is chief of packman's design for the Society's Astronautics Division and chairman of the Society's Space Flight Technical Committee, which wrote the proposal.

Other committee members are Karl J. Rostert, General Astronautics; George H. Clement, Rand Corp.; Mr. George D. Goldsack, Washington, as the State and General Development; and Col. William C. Davis, Wright Air Development Center; ARDC; Frederick C. Dornier, Aero Manufacturing

Corp.; Andrew G. Haley, Washington attorney; Richard W. Porter, General Electric Co.; Daniel C. Kromel, General Aircraft Corp.; Milvia W. Rana, Project Vanguard, in-house director; Naval Research Laboratory; Alexander Stern, Lockheed Aircraft Corp.; S. Fred Singer, University of Maryland; Karl R. Schilling, Project Vanguard program chief; Naval Research Laboratory; Hubert Strahlheim, Kensington AFB; and Wendell van Brunt, Army Ballistic Missile Agency.

These were submitted that Atomic Energy Commission's report on missile rockets and targets (AWF Aug. 18, p. 27) is for space flight application rather than flight within the atmosphere. Both Rostert's Division of North American Aviation, Inc., and Lockheed Aircraft Corp. are known to be involved in rocket solid state.

Single Manager Sought

Society officials privately expressed indignation over the Defense Department's new office of space manager for air, missile work and space flight program.

In his letter to the President, Capt. Truax and a national program and an independent agency would "ensure the eventual superiority of the U. S. in the new field. Our society feels that any less forthright action will not be all right to continue the human race."

Truax also said the American Rocket Society has set up a file of 500 names of "top people in the business who have volunteered to work free of charge on problems we might suggest out until we can make it. He said the American Rocket Society plan can be carried out without interfering in any way with military operations, aside through the kind of cooperation with the services and independent status that Atomic Energy Commission and National Advisory Committee for Aeronautics implies.

The agency would be called something like Administrative Research and Development Agency (ARDA), with cognomen over all except strictly military projects.

Aeronautical Research and Development Agency would serve basically as a management organization and trust to industry as much as possible. It would develop equipment, conduct experiments and evaluate information. Where necessary it might maintain small research laboratories.

Agency Makeup

This agency would include representatives from the general public and the scientific community, and from Defense, State and General Development, and the Central Intelligence Agency.

American Rocket Society also proposed a conservative 25- or 30-year

long plan including in this order: test lines of up to a ton, instrumented rockets to explore atmosphere; space and the space instruments and control; and exploration of the Moon and Mars, manned bypassed gliders, small reusable satellites for 10 to 10 percent, and manned lunar operations, including landing on the moon.

Democratic Leaders Attack Administration Sputnik Reaction

Washington—Democratic congressional leaders last week attacked the public reaction of confidence and the mild reaction of the Eisenhower administration to Russia's satellite-launching accomplishments. They said it would be more vocal in the months ahead when Congress convenes.

During a bipartisan White House session of 14 Democrats and Republicans on congressional reaction on legislative work last week, Sen. Lyndon Johnson (D Tex.), Senate majority leader, commented: "They need a greater dose of reality."

The chairman of the House Appropriations Committee, Rep. Clarence Cannon (D Mo.), complained: "The danger confronting the U. S. and the democratic deficit suffered (Russia's satellite launchings) were announced only incidentally" at the conference.

Defense Expenditures

The administration did propose to the congressional leaders that Fiscal 1959 defense expenditures be \$40 billion, 52 billion over the "Eisen" 518 billion expenditures totaling especially at the Fiscal 1958.

Actually, under spending under this plan would be slight. Defense expenditures during the first four months of Fiscal 1958 were \$11 billion, a rate of \$19 billion for the year.

The White House figures followed announced on U. S. defense strength by Deputy Secretary of Defense Donald

The first three could be met as completed by 1959 and the last three by 1961.

Projections were based on present state of the art in missiles, rockets, carriers, etc.

Most proposals got forward since Oct. 4 elections this favorable to as little as 10 years.

A Quarles on territory before the Senate Preparedness Investigating Subcommittee headed by Johnson. He told the subcommittee:

"Taking the missile program as a whole and comparing them (Russian) program with our own, I estimate that it is today our program is ahead."

Quarles Confident

Quarles said that "we might be in danger of creating a world impression that our work points are neither there actually are." Quarles added:

"Language matters program. As of this time, we are right on a par with them in the difference are such that, viewed by and large and being everything into serious, one would find it very hard to say which program is ahead." He said the chief of staff of the three services would agree to his statement.

Electronics: "We are ahead of Russia in military electronics, flying in a school."

Ballistic missiles: "They have one that is more powerful as an individual as we have one . . . (that) one would be more than match the statement that they were ahead of us in a certain category."

Jet engines: "They have individual jet engines that have greater thrust (that) does not do any mean work for the overall quality."

Johnson's Reaction

Johnson, paralyzed at Quarles' complacency, retorted:

"It is not if it is that the Americans people can have adequate defense and cut their nose too-and even have shipped means on it."

Quarles reported that, except for missile programs, there has been no change ordered in the tempo of production of any other military items.

Quarles said that, with the benefit of hindsight, the satellite development program should have been given to the Army's Ballistic Agency in 1955, rather than to the Navy. At the time, he was concerned in placing it with Navy. Had the program been given to Army, Quarles said, "very possibly" the U. S.



NUCLEAR powered space ship proposed by Keith Eldridge of General's Astronautics Division has the user's expenditures expended from the propulsion unit by a 100 ft. shaft. Astronauts would heat liquid hydrogen contained in the tanks (closed) just above the rocket engine. Very high liquid hydrogen would be released into liquid hydrogen and the total energy produced by the engine would immediately above that for a rocket using today's chemical propellants. A modified version of the craft would be able to use a very high energy (explosive) to heat from the Earth to Mars and back in about 100 days. They test using the maximum energy together would be over 500 tons.

would have launched a satellite missile ahead of Russia's Oct. 4 Sputnik 1.

Prevailing Couatier on testimony before the subcommittee, Secretary of Defense Neil M. McElroy, in addition to announcing the decision to produce both A-7's (fighter and USAF). That Couatier (AW Dec. 2, p. 26), and he believes these things should be done.

Strengths, reliability factors in increasing the speed of response for Strategic Air Command and Navy carrier planes and through further disposal of SAC.

- "Invest in improved detection devices for the type of weapons that it is likely to meet in the future."
- "Move forward rapidly" on anti-missile forces.

- "Pursue an active program in various satellite fields, which seems to have planning and some of which seem to have very definite and specific interest for the country."

- "Speed development of ballistic missiles, including Navy's ship and submarine launched missiles. This development is urgently important now."

- "Move right along in the testing program" for General's Atlas interceptors, aerial ballistic missile and continue to push Navy's Titan 2's.

- "Pursue the subject of increasing capability of our ground forces," the Army and the Marine Corps.

- Continue research and development on advanced weapons.

As the subcommittee's report, McElroy and he will study.

- Incentives and penalties for contractors, especially in the missile field. McElroy testified that this problem is serious, and that it is not being solved by the government, but he has been directed.

- Testimony of Dr. John P. Hagen, director of Project Vanguard, that he has repeatedly requested grants for the satellite work in 1975 but got no action on it. McElroy said he was told the request never reached the Defense Department.

AIA Gets Budget Cut; Dues Structure Altered

Board, Air-Naval Industries Association of government has slashed approximately \$300,000 from the association's proposed 1976 budget, cutting the total figure to about \$1.5 million. At the same time, the board lowered the maximum dues category to its largest members and lowered overseas dues charged to member firms.

The minimum annual dues were lowered by the board from the previous \$185,000 to a top \$75,000. The maximum dues were raised from a low of \$180 to \$1,500. After learning of the board's new dues structure, representatives

Flying Airlauncher?

Flying suborbital cruise ballistic missile launchers have been proposed by Prof. Theodore von Karman to eliminate the tactical disadvantages of long-ranged suborbital fixed launching sites. Prof. von Karman's suggestions were made to Science, the French scientific journal. He believes that America's Flying Air could be developed into a multiple-missile, sub-orbital launching vehicle, as a large solid propellant rocket with 10000 mps.

von Karman's idea was presented at the board's meeting here and they would recommend that this company be given first AIA rather than the other two.

An AIA spokesman said the change in the dues structure was decided upon because it was felt the logic for the new pricing, a discounting of dues of the association's budget.

Most of the \$200,000 budget cut will be felt by AIA's public relations activities, which are expected to be

associated with H&J & Keesbom in Washington. Some staff reduction and a curtailment in public relations as well will be complete by January.

Both members also are considering a change in the association's name that would make reference to both aircraft and missiles. A total of 27 private missile contractors are AIA members.

In other action George M. Butler, president and board chairman of the Santa Ana, California, was elected chairman of the AIA board of government for 1976.

Butler will be the first AIA chairman to serve for a full year. All his predecessors having been elected for six-month terms. He replaces Walter C. Collins, president of Northrop Aircraft Inc., Hawthorne, Calif.

AIA's governors also re-elected Dr. W. H. Ransom, vice president, David R. Cook, president, Leland D. Webb, vice president and Western Region manager, and Harrison Bland, Jr., assistant treasurer.

C. J. McCarthy, chairman of Chance Vought Aircraft Inc., Dallas, was elected to a vice presidency.

Swiss Government Initiates Order For 100 Home-Built P.16 Fighters

By David A. Anderton

Geneva—Swiss government has approved in principle the purchase of 100 Swiss-designed and built PFA P.16 fighters, valued at \$175 million, as the second step in re-equipping the Flugwaffe.

That step must be purchased for 100 F-16 fighters (AW Nov. 15, p. 27) for ground support. Total funding is to be approved for that purchase is about \$150 million, including spares and engines. Amount of the P.16 order has not been disclosed.

Final approval for both orders is expected at the end of the month's session of the Swiss Parliament.

Many Swiss have believed the Swiss still need a third type of fighter to provide top cover for the Hunter and P.16s when they perform their ground-attack missions.

Neither of those airplanes has a rate of climb that can quickly, then in one technique, interception for a country the size of Switzerland. For that reason, French and American sales teams met concerning their efforts to sell the Swiss a supersonic interceptor.

Observers here say the P.16 order is a quick action to sidestep critics of the Swiss aircraft industry and thus associated with the country's 1976 election. purchase of F-16s. Less than one year ago an order for 80 French-built Dassault Mirage 40 was in the process

of being approved when it was suddenly rejected in favor of voting an additional \$10 million to the development of the P.16.

So far the P.16 program has accumulated for \$175 million, spent on the design, development and construction of six prototypes. Only two of these airplanes are now flying.

They are still under construction and one is on the flight line on a daily basis. Swiss officials report that this country is not equipped to test the P.16 on any other test, implying at a reasonable cost. They say that no other country at the time and resources of the Switzerland has even had to develop a previous air force of its own, but has instead turned to foreign purchase.

They point out that the "Ban Stett" aircraft of the P.16 seems to indicate the fact that the engine is powered by a British engine, the Armstrong Siddeley Sapphire. Normally, a major portion of the funds voted for the P.16 would flow to go out of the country.

Final flight trials of the brand of the contractors for the Swiss order announced the choice down to the Hunter and the P.16. Both these airplanes were tested in a group of six Swiss pilots on numerous occasions. They were demonstrated in accordance to the criteria of the federal government.

These various capabilities were compared to the performance of the P.16.

Hawthorne Vought fighter-bombers now among part of the Swiss Flugwaffe.

Swiss up the P.16 comes better reviewed and has about 50% more fuel capacity than the Hunter. In addition, the plane has a slower approach and landing speed. The P.16 is also called a more stable platform.

But with all these cited advantages, the P.16 is much more than the Hunter, and will not be available at the same time. The estimate was that the P.16 will be some months behind.

Swiss contractors have been receiving three proposals for aircraft and have made much shipping some of other countries looking at foreign air plans. They showed interest in several U.S. fighters, which might have been available at the right price, to the Swiss. But NATO countries have still said no. Swiss aircraft exports from the U.S. and the Swiss see no profit in further discussions.

Delays in the development schedule here have struck and the Swiss could lose one year to deliver them. They then selected the Hunter order this year, when the order was first placed, they would have had production-line priority of position over the British order.

Chase Vought Wins USAF Alloys Contract

Dallas—Chase Vought Aircraft Inc. has won a \$1,097,554 Air Force contract calling for development of tooling against the existing high strength alloys specified for aircraft in space program. The contract is for March 2.

Contract awarded by Air Materiel Command makes Chase Vought the prime contractor in a two-year program. Chase Vought will develop three foundation design developments and final design will be available to all branches including savings for military aircraft.

After three foundation have been chosen to do the actual development work, the program will move into a laboratory test phase. Tests will be made to select steel alloys that can be stressed to 150,000 to 220,000 lb. per sq. in., and methods developed to make them available. Ultimate goal of the program is to produce usable savings that can develop tensile strength of 200,000-300,000 psi.

Actual parts will then be designed by Chase Vought. It is to be the three foundation selected. The program will move on with the final production of a combined part on larger lots to determine whether it can be produced in quantity, and final phase will be pilot production of selected castings, in quantities large enough to establish cost savings.



Vertol Tests T58, T53

Vertol Aircraft Corp. is demonstrating two two-turbine powerplants, offering a choice of General Electric's T58 (rated at Economy's T53) turbofan. Effort power package can be provided in a modified lot for Army or USAF use. The Vertol H120 is in operation, but the company is offering its modified version, the Vertol H120, to replace and replace. T58 installation was made in an H120 and developed alloys contract for the Army and Navy's Bureau of Aeronautics. It has been flying since September. The engine is in a turbine arrangement. Economy's T53 was placed in a helicopter called the Vertol H120, with two engines installed side-by-side, and flew less than a month ago. The aircraft was developed by the company with the Army providing the engine. Vertol air replacement of the H120's overall weight H120 incorporating engine by two turbine models in a 40% increase in payload, plus a gain of 10 mph in additional speed.





REFUELING from Boeing KC-135A tankers enabled McDonnell RF-105s to set cross-country records. This is a practice backdrop.

Jet Tankers Add Margin in Speed Dash

By Edwin J. Balkas

New York—Air Force's improved aerial refueling capability provided its new improved Boeing KC-135A Stratotankers was demonstrated in a recent cross-country speed dash in four Lockheed Air Command RF-105C Voodoes, which took three hours away from Navy to a single day.

Pilots from the 17th and 18th Tactical Reconnaissance Squadrons, 36th Tactical Reconnaissance Wing, Shaw AFB, S. C., broke previous Navy marks by their approximate average, went to start they topped some 39 min.

from record set last summer by Maj. John Glenn Jr., in a Chance Vought F4U-1P Corsair, on the way to test and recording portions of their flight they dropped two hours and three hours, respectively from previous mark set by a single Douglas A-1H Skyraider attack bomber.

Maximum Afterburner

Lt. Maj. Glenn, the Voodoo pilot, made maximum use of afterburners on their F4U-1P-13-equipped Voodoes, one pilot told Aviation Week staff at least he exceeded 1,500 mph, but added that this was not "ready"

the maximum speed of the airplane.

Air-to-air refueling presented no problem, he noted, despite the fact that the high-performance pilots were introduced to the Strategic Air Command KC-135A for the first time when they went to the West Coast to prepare for their flight. Comparing the KC-135A with previous general Boeing KC-97 and KC-10 tankers, the pilot pointed out that tankers were made at approximately 11,000 ft., with tankers' ground speed being 520 mph. He noted that when using the piston-powered tankers, aerial operations were at altitudes of 15,000 ft. to 20,000 ft. Tankers could only get to about 120 ft. speed, power, and position to high speed fighters.

Two Waxes

At Fort Worth the Voodoes off from Ontario, Calif., in two waves of three planes each, took place taking off at approximately five minutes apart and waxed spaced about 40 minutes apart. Two of the airplanes were spares, as one plane had to drop out, other planes returned at the first fuel contact, which was approximately 450 mi. from take-off. Air Force, but not disclosed the number and location of tankers planes.

Each of the planes flew the same VFR flight pattern, which was the reason for taking spacing. Air Defense Command's ground radar provided pilots with individual guidance for navigation. Planes divided to 45,000 ft. after takeoff, flew between 45,000 and 48,000 ft. during the light except for descents to refuel.

Pilots used charts to check fuel and distance. Planes was to allow a 2,100 lb.



SUPersonic SCORE KEEPER

Stock-and-bill power of United States air defense weapons of the future will be tested by modern aerial target systems like the supersonic USAF XQ-4 developed by Raytheon Division of Northrop Aircraft, Inc. The XQ-4 can duplicate the performance of a modern high-altitude bomber or missile. Latest of a long series of Raytheon's aerial target systems, it takes up the score of theoretical hits and near misses and is recovered by parachute for repeated use. Today, other Northrop divisions are building the first microcommercial guided missile, the USAF Seek, SM-62, the revolutionary supersonic two jet USAF T-38, first of its family of high-speed, low cost aircraft, and the new low-altitude ground-to-air missile, U.S. Army Black, with Raytheon Manufacturing Company. Advanced Northrop engineering and production techniques will continue to lead the aircraft and missile industry in providing low cost solutions to defense problems.

NORTHROP
AN AIRCRAFT COMPANY OF GENERAL ELECTRIC CORPORATION



CLOSEUP shows RF-105C flown by Capt. Ray Schenckel (standing) at Alton, Mo.



first ... plane to land at the South Pole
place ... Operation Deepfreeze II
heater ... Herman Nelson, of course



The first aircraft ever to land at the South Pole—and the first Americans to set foot at the South Pole ... these were history-making feats achieved by Operation Deepfreeze II. The mission was carried out on October 31, 1956, by a party and crew of seven men in this Navy B-6D. Naturally, Herman Nelson Portable Heaters were chosen as support equipment for this important mission, providing quick, unfailing heat. Herman Nelson's 16 years of experience in the portable heating and ventilating field can be put to work on your problem.

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feel move at each landing point, which would give them altitude of about 150 ft. In the narrow airport with reserve of five minutes over the field.

Voodoo covered some 180 mi in following the leader in refueling, practicing on to hook up and feel for about 10 mi. and back and forth with the leader, then back up again to top off the tanks. Run took about 10-12 mi.

Speed run was handicapped once by a rise in predicted temperature which landed speed, during the first half of the trip. Flight planning was guided on temperature at 45,000 ft. being approximately -56C, during the flight pilots estimated temperatures of approximately 60-70C. From Kansas City to New York, temperatures went down to near those planned and pilots were able to pull up speed.

Last refuel was made about 150-175 mi. from New York, and here there was a slight snag that cost the one-way pilot a few precious minutes. American West did not bid. Plan was that the fastest over-arc would catch the enough fuel to get to New York with reserve in power (maximum speed) in final leg, undoubtedly all four airplanes were topped off. Thus, fuel of one aircraft landed at McGuire AFB, N.J., after passing over the Phil Bennett NAS tower for F-41 calibration, with approximately 5,000 lb. of fuel left.

All planes carried a full complement of reconnaissance cameras in accordance to actual mission.

Record breaking flight of the T-38C Voodoo marked the first reconnaissance use of this battery of Fairchild and Hercules aircraft in Century series operations.

The reconnaissance camera carried by the planes were:

- One Fairchild KA-2/12 as fuel length forward drag and associated oblique to point 15 deg. below the horizontal, and 9 x 9 in film.

- Three Fairchild KA-2/6 as fuel length side mounted in a standard fore-and-aft arrangement to cover 180 deg. horizon-to-horizon, with 10 deg. extension on each side to give a full 200 deg. coverage. Units also use 9 x 9 in film.

- Two Fairchild KA-2/36 as fuel length split vertical (slightly off vertical) all cameras which use 9 x 18 in film.

Night reconnaissance equipment is the same as the day, except that the three Fairchild KA-2 investigating cameras are replaced with three Hercules K-46 units in the same configuration. K-46 cameras use 3 x 3 in film.

Night configuration also includes four T-38 as KA-2 first system.

Exposure control system used on the Voodoo is SCDS (Simplified Camera Control System) which is a simplified outgrowth of UCDS (Universal Camera Control System) developed by Bell Telephone Instrument Co. (NAV No. 21, 1955 p. 41). SCDS was developed by Henry Macdonald and Co. and Alvin E. DeMott Laboratories, Los Angeles, Calif.

The exposure control and image ma-

tion compensation package of the SCDS was imperative during the flight, but the autoexposure was working. Exposure and shutter speeds were kind set on the ground.

A Chicago Aerial Industries terms light exposure was on each plane. Two of the four aircraft used color film in the single forward drag KA-2 and two KA-1 all mission. However, pilot of one of the two planes did not turn on the color camera and the other turned it on as he returns (it is that all 48 ft. of color film was exposed over Kansas with a much as a 95% overlap. However, some good color photographs were taken.

Two other 1/1000s used color film and white film. Because of vibration problems in the Voodoo, shutter speeds of 1/1000s to 1/4000s in a series were used with black-and-white film to achieve blurring possibilities. A mass blue filter was fitted over the lens.

Color was shot at 1/1000s and F 8.

W. G. Key Quits Fairchild For Nixon Press Chief Job

Washington—William G. Key, assistant to the president of Fairchild Engine & Airplane Corp., has been appointed press chief for Vice President Richard M. Nixon.

Key, 43, is resigning his position with the company, to accept the Nixon post. He is a former vice editor of the Atlanta Constitution and has served as assistant director of public relations for Capital Airlines.



First Photo Shows Ryan VTOL Vertiplane on Rollout

Ryan VTOL Vertiplane, powered by Lycoming T53 as fuelage, is shown at recent rollout. Double retractable wing flaps define propeller positions, and pilot's wingspan extends to flap tips. Two-seat version is 27 ft. 5 in. high, 19 ft. 5 in. high, 10 ft. 5 in. high, 10 ft. 5 in. wingspan, gross weight of about 2,600 lb. Vertiplane was designed, built for Army under Office of Naval Research direction.



Russians Show Off Huge Tu-114 Transport

Russian Tu-114 neither bears obvious resemblance to Beech bomber and its gross weight probably approaches that of B-59—318,000 lb. Photographs are four 12,000-wp. turboprops taking contrasting propellers. Length and span are approximately that of B-59—180 and 180 ft. respectively. Main landing gear retracts inward into long wheel well nacelles.



Back of approval the Russian Andrei Tupolev, seated in the Tu-114, comes from Soviet Gen. Kharlamov (left), . . .



Chief Pilot A. Yulstov in cockpit. Side view over instrument panel, control column layout, single throttle.



Double-deck fuselage carries passengers on upper level, has kitchen and baggage below. Long range version carries 120 passengers, medium range 170. On short range, such as the Moscow to Chongqing stage, it can carry 220 passengers.



and Mao Tse-tung, Chinese Communist leader, also is posed with Tupolev prior to his departure from a Moscow visit.



Central of three passenger decks is restaurant type, with 45 passengers. Forward seats 42, tail 54.



Passenger dines in restaurant.



Forward passenger compartment has no direct seating. These passengers are in rear.

Inadequate Facilities Jeopardize Jet Era

By Glynis Garison

New York-Airline jet operations could be completely without adequate ground equipment—passports, mail of which is in major need—members of the American Society of Mechanical Engineers were told last week at their annual meeting here.

Jet age ground support needs often are ignored in airline management plans, and the resulting equipment shortages, says Glynis Garison, president of Engineers, Airline Association, advised the engineers.

From discussion by Wier and other speakers at an aviation symposium of the ASME meeting, it appeared that many involved ground personnel serve with the airlines at the aircraft base before their jet age field use. Concepts must be applied to the handling of aircraft, passengers, baggage and cargo, but in general the challenge has not yet been met.

Airports Overstressed

Not one airport in our nation today, says Garison, is capable of handling the Boeing 707 in an adequate terminal building or taxiway. "At present, and some available airports are planned and are available in the future. Initially at least, American's jet will have to operate at its three main airports separately to follow other less than ideal procedures, accord use to Wier."

Engineers are not made enough to eliminate the problem of ingestion of foreign materials into jet engines, the American official said. Only Berlin has adequate towers, and other airports where the 707 will operate have not even planned to build their towers, according to Wier.

The problem is recognized, these men have a lot of talk about it "but nothing has been done," Wier said. Ground equipment needed for the jet includes large towing vehicles with about 15,000 lb. draw bar pull compared with 12,000 lb. of today's jets, Wier said. Also needed are large electrical power units of 175 KVA per jet operation, more variable jet engine starting devices, lacking facilities to handle the great volumes of jet fuel.

In the cabin sections covering luggage and cargo loading, more problems, passenger service requirements and the shortcomings of ramp handling equipment, the engineers also heard.

At Los Angeles of Trans-Canada Air Lines jet fuel threatened ground equipment by engine problems at its terminals, handling, use of more turbine power and less manpower reduction of the amount of possible equipment ma-

naging an aircraft on the ramp. Airlines and airport administrations have never had a better opportunity to integrate ground operations with terminal structures, Garison pointed out. New aircraft will be operating with more terminal buildings, and there has been time to plan the best feasible operation affecting both facilities.

To get the most out of jets, Garison said, terminals will have to be located at airports, not airports. It's been noted that having to walk the occupied passenger for moving aircraft and from terminal, although other methods are under discussion. The conventional surface will be the "work horse of the ground service" in a jet age, particularly in the congested period of jet operation.

Ramp equipment techniques must be applied to the light of four jet age problems: passenger to jet, nose, blast heat and fumes. While work records at long time on airborne sound suppression to reduce blast noise, research on cabin noise suppression is lagging, and the long-term solution is not yet to be met, Garison said. However, this noise is highly directional and can be deflected somewhat by barriers.

Ramp Needs

Ramp needs also can be adequately handled from terminal buildings by employing ramp vehicles closed using enclosed loading platforms, and stairs and bridges on opposite sides of buildings. Passenger boarding aircraft on ramps now moving aircraft "probably will have to get used to the noise," Garison said. The jet noise which could be alleviated by using barriers, although they could alleviate problems with aircraft.

When operational frequency are not being indicated, aircraft movements might be a better solution to blind problems. Blind is not considered a major problem. Focus especially where congested is the jet fuel, but probably considerable close handling units facing ramps in large jet operations.

TCA is proposing and prototyping a self-manned baggage cars in that would offload DC-8 baggage onto three belts, drive to the class one and dispose of the load in a mechanical delivery unit.

E. Reed Fries, assistant technical director, International Air Transport Association, said in the application of wind principles to jet ground handling needs, one will get almost as many solutions as there are problems. Fries predicted an ideal airport an international airport would like to see it, including an air conditioned terminal building with

acoustic windows against noise, enclosed two-level ladders with closed doors for sound-level loading, nose or tail or jet loaded containers for luggage, fuel electrical power, conditioned air and other services supplied from remote lines in fixed facilities on the ramp.

Rudolph H. Tolson, assistant vice president and equipment division of the Trans Co., discussed jet fueling equipment and reported that he did not know whether it is to be required whether JP-4 type fuel or kerosene will be the major fuel used by commercial airlines.

Charles H. Dolan, vice president of operations of Eastern Air Lines, said, in service to passengers will determine whether an airline goes as close as the expected traffic volume. Present service, he pointed out, from a jet fueling is almost nonexistent. Jet fueling has been poor, although electronic equipment promises a solution. Lack of flight information to passengers is a serious problem, and new solutions in flight information are being developed. Jet fueling has been poor, although electronic equipment promises a solution. Lack of flight information to passengers is a serious problem, and new solutions in flight information are being developed.

Handling and loss of baggage, a substantial financial and customer relations problem now, has "distinct" chances for changing, jet operations Dolan said. New tools and procedures are needed in this area, but a mechanical equipment need be within the current economic means. On terminal equipment, he said, the jet age is not such thing as it is, although terminal house requirements differ at each airport. Generally, protection from weather and one-level operation are required. Use of the jet age terminal equipment to handle baggage and cargo loading equipment must be certified as a possible answer to protection not only against weather but against noise and blast of jet engines.

Aircraft Servicing

Cabin cleaning and service of jets may be the key factor in determining two-terminal area, Dolan said. It is doubtful if a jet, jet can be turned around in 15 to 20 minutes, but it is possible if full aircraft servicing is required. The Delta official said he had even heard a proposal for an "inflight jet service." An attendant carried around a light to keep up with cleaning requirements. One of his jet pilots, Dolan said, in present jetter location, which forces passengers in effort to walk through the kitchen and water area with fuel handling. Equipment must be available to handle the jetter, Dolan said. He suggested development of enclosed pre-loaded jet fuel and pointed out that an associated

lights, the jetter could be viewed for additional passengers.

Aircraft release design must be improved for better passenger service, Dolan said. Among the items needed improvement are air stairs and stairs. **Donald E. Gray**, executive vice president, Atlantic Division, Pan American World Airways, discussed jet fueling planned equipment for terminal building at Midway Airport, pointing out that the Midway station was unique in that each aircraft has its own individual facility. Two general conditions in terminal design, Gray said, are saving a particular purpose and time. Thus, specialization of a building for passenger use and extensive utilization of the building almost automatically make a good terminal.

Early Booking

For American needs to allow its jet passengers to board their aircraft in early in the day, the airline has found that the plane is ready and on the ramp. The passenger can make their own arrangements, perhaps have a drink or eat, and smoke while they wait departure.

Gray and the airline has considered saving between gates and airplanes, as it does in London Airport, but decided the idea is better of the "one-block" terminal design which has jet fueling in the terminal building.

Bl. O. Bernick, technical director and coordinator research and development program, A. F. Note and Vibration Control, Wright Air Development Center, said the Air Force spent \$140 million in lighting aircraft terminal design from some in the case of military aircraft, which he would not attempt.

Parade, and much work must be done before jet age will be fully satisfactory to construction from some standpoint. Airport personnel in buildings near ramps can be protected against ramp noise by suitably designed structures, the scientist said, but the buildings will not solve the noise.

De France and aircraft release noise has been fairly well controlled, but the predicted quality problems in this area is future jet aircraft.

Community Study

P. N. Reedy, study director, National Operation Research Center, reported results of a recent \$100,000 study of community reactions to noise. Field has been conducted by the Air Force. Reedy's findings of 1,700 interviews in houses near Air Force bases, Reedy's statistics showed that the noise noise is the biggest exposure to noise to prevent the noise measurement is required. When knowledge of the jet's importance and belief that base authorities are showing consideration in present, the measurement tends to be less,

Reedy reported. The Air Force's measurement device to the Air Force as a result of the study more intensively at other bases.

L. H. Hennessey, of Air Logistics Group, presented a plan for using various items of ground equipment in combination to reduce or eliminate ground noise. These in that "system approach" to jet noise include a moving and ground power vehicle, portable sound suppressor and mobile engine on up and out system.

Cargo Handling

The ASME members heard three speakers point out the need for improvements in cargo handling techniques. Developments in ground handling equipment used in airfield facilities will bring optimum, maintenance and traffic functions of an airfield, Arthur V. Novack, executive vice president of Seaboard and Western Airlines, pointed out.

This coordination has been lacking in the air freight industry, Novack said. Seaboard and Western has been operating transatlantic freight service for years, and having that service "not one manufacturer has come in and attempted to show us how we could do it better than we are doing. We are not alone in this with a view to developing equipment which would help in better time in some cases," Novack said.

Ground handling and loading of cargo, the Seaboard and Western official said, is still in the pre-WWII War II era. This airline is still using the facilities for handling of its Super Constellation that was used to load the C-47, C-54 and C-54.

With a true freight airplane still in the plane.

Republic Proposes Transport

Short to medium range four-engine turboprop transport featuring good short field take off and landing performance is being proposed to the airline industry by Republic Aircraft Corp.

Plane's name, Rainbow, was borrowed from the company's SR-12 long range photo-reconnaissance plane. Two of them were built and flown in 1945 and 1946. New plane also will have the SR-12's wing and airframe fuselage. Short take off and landing performance is achieved with the help of large, ducted Fowler flaps and landing gear doors.

- Some details of the airplane include:
 - Engines being proposed by Republic are the General Electric T54 and the Rolls Royce 8. De-10. Later is rated at 2,600 hp.
 - Normal gross take off weight is listed as 77,000 lb. for the Rolls Royce propellers and 76,000 lb. with the General Electric engines.
 - Span is 121 ft. 11 in., length 87 ft. 6 in. and height 29 ft. 6 in.
 - Cruise cruising speed is set at over 400 mph, and cruise average about 2,500 miles.
 - Landing altitude will be about 15,000 ft.
 - Take-off will be a maximum gross weight at about 3,600 ft. and landing will 4,000 ft. at sea level on a standard day.
 - First class passenger capacity is 66 using three-and-two seating while second class will hold 80 passengers, using three-and-two seating.
 - Charles Porter Associates has been retained to do the interior design and color scheme.

Bell helicopters have passed the most rugged test of all —



THE TEST OF TIME!

At work for more than
2,500,000 hours

- in the desert
- in the mountains
- in the Arctic and Antarctic
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.. Bell helicopters have proved their dependability. And what better test of dependability can there be? Certainly no more-rugged test can simulate the operating experience of the Bell H-33. No other helicopter has done what the Bell has done.

Because it's the actual "performance" — not "rehearsals" — that stands in the records, the Bell H-33 proudly points to its own... more flight hours, lower maintenance costs, more dependability... yesterday, today AND TOMORROW!

BELL H-13H FEATURES:

1. Largest approved civil load
2. Interchangeable main blades
3. Cyclic head (power steering) that incorporates latest Bell design and developed lock and lock valves
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DERATED ENGINE PROVIDES

1. Improved hot weather and altitude performance
2. Maximum operating period between overhauls
3. Reduced maintenance and greater reliability
4. Maximum power for emergencies
5. Maximum availability — 80 percent over



Investors Ask Change in Aviation Policy

By Paul Eastman

Washington — Investment Bankers of America urged a complete review, but most of government policies affecting the aviation industry.

In a report by the American Aviation Securities Committee presented at the group's annual conference, it was recommended that government and industry begin working together immediately to try and find suitable solutions to industry problems.

The committee, and domestic truck, airlines and the aircraft manufacturers or fundamentally different components of the aviation industry and face the difficult task of financial and government problems. The report said.

"Under the restrictions of Civil Aeronautics Board rate regulation, an airline lacks the margin power and financial strength to serve the public adequately and to finance their new jet equipment expansion."

"Under the violent fluctuations of Defense Department procurement policy, aircraft manufacturers are faced with increasing difficulty to obtain the capital funds and long-term credits necessary to finance their crucial role in America's air defense."

Stability Needed

To solve airline problems, the committee recommended that President Eisenhower appoint a qualified unit to undertake a complete review of the Civil Aeronautics Act and CAB procedures under the act and present to the President and Congress a concrete program for constructive action.

The committee said the solution to aircraft manufacturers' problems lies in a congressional appropriations policy and a Defense Department procurement policy that will afford manufacturers adequate stability.

The group said that, at bankers who have to finance the growth of aviation and also in citizens. "We believe it is the public interest to prevent constructive negotiations concerning the air traffic and aircraft manufacturers' separate problems."

From the investment bankers' viewpoint, domestic bank interest presents a whole series of financial problems. Airlines are subject, the committee said, to CAB utility-type regulations of fares and of operating plans the added burden of national competition. A government ceiling is imposed upon earnings, while a low competitive common denominator rate is imposed.

The bank charged that the CAB and its staff have not given with the demands of the airline industry and the

expansion of the national economy. Through rigid application of financial concepts and practices, the report said, the industry is being squeezed out of the industry, it is being driven to encourage and develop.

Airlines must raise substantial sums of money to finance their re-equipment programs, the report pointed out, and are forced to compete with all alternative forms of investment, and with the profit needs of all alternative industries bidding for the limited supply of investment funds. The existing public, it said, must be reduced to allocate more funds to the support of the airline industry in the months needed.

"To achieve this necessary end," it added, "the interest must be allowed not only an adequate rate of return on total investment, but a sufficiently low operating margin to permit adequate safety and growth and to give the investor a sense of confidence in the future profitability of the industry."

The restriction and an adequate investment return and a safe operating margin will create a more profitable passenger fare increase. The alternatives, the committee added, are:

- To allow that the U.S., with the world's wealthiest economy, can only afford a second-rate air transport service.
- To keep where the financial strength needed to fulfill the public service has been changed from its Congress.
- To remove the cause of the program, facing the domestic airlines, which self-supporting independence in a world where an airline must have transport assets to survive as transport users.
- To drive the domestic budget higher and the government financing a military jet transport fleet when present plans are to rely upon the nation's jet facilities, which would be available in emergency as 45 hours later through the Civil Reserve Air Fleet.

Industry Problems

As for the aircraft industry, the committee said it too is regulated by the level of defense expenditure. In recent years, it said that between 85% and 90% of total aircraft sales have been military. As a result, the report added, the bulk of the industry is subject to government limits on profits but not on expenses or losses.

The committee pointed out that aircraft contractors face the added burden of recapitalization and forced liquidation of earnings up to loss view after completion of contracts.

It also said the industry remains subject to violent expansion and contraction as a result of changes in world

events in defense strategy, in domestic policies, and in administrative decrees.

As a result, the report added, the investment community has also adopted an aircraft manufacturing stability approach for the industry.

Airlines, meanwhile, continued to present testimony of officials and financial experts designed to convince the CAB that a passenger fare increase is necessary to finance financial health in the long drawn-out General Passenger Fare Investigation.

Charles E. Smith, Bonnell Airway president, took the stand last week and told the CAB that his airline needs a maximum fare increase of 12.5% to assure adequate future savings.

\$252 'Economy' Fare Approved by IATA

Paris — Agreements to introduce a new third-class "economy" fare on North Atlantic service and to increase present tourist and first-class fares on the same routes were approved by the International Air Transport Association's biennial conference here.

The first will become effective April 1, provided each government involved approves the rate changes. An airline attempt to impose North Atlantic fares was dropped because the Civil Aeronautics Board disapproved the proposal, although all other governments continued had granted approval of the sale increase.

Under the agreement, the present 11-day economy fares will be discontinued. The economy fares will be increased 20% from their current level of \$251 and will be \$301, according to the basic New York-London route.

First class fares between New York and London will be increased from \$480 to \$485 on one-way tickets. Tourist fares will rise from the present \$280 economy rate to \$315.

Scheduling arrangements on aircraft design used for the economy service will be limited to a 34 inch pitch—the distance from the back of one seat to the seat in front of it. Such arrangements will be equipped to fit only slightly. Tourist seats will have a 39 inch pitch, while first class seats will have a 43 inch pitch. Staircase arrangements a pitch of at least 47 inches.

Based on the basic economy flights will be confined to windows, no aisle, and no mixed water. No alcoholic beverages will be served or sold on the economy flights.

Crews will be free to operate aircraft in a two-class or three-class configuration or a three-class configuration.

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THE ROLLS-ROYCE CONWAY BY-PASS TURBO JETS

*has completed an official
British Ministry of Supply
type test in accordance with the
combined U.S./U.K. test schedule
at a rating of*

17,250 lb. THRUST

and is in production for the
HANDLEY PAGE VICTOR B. Mk.2

*The British Air Registration Board have
already confirmed that a civil version of the
same engine has successfully completed a 150 hour
test run in accordance with the combined U.S./U.K.
Civil Type Test Schedule at a dry take-off
rating of 16,500 lb. thrust.*

ROLLS-ROYCE AERO ENGINES LEAD THE WORLD

French, U.S. Negotiators Begin Review of Bilateral Agreement

Washington—French and U.S. State Department negotiators will meet here tomorrow to begin a complete review of the air transport agreement between the two countries that has been in effect since 1946. Airlines believe the discussion will be among the most important held in recent months.

Agree to come up during negotiations is one of the Polar route between Paris and the West Coast of the United States. Both Trans World Airlines and Pan American World Airways are now flying the route, although the French does this as, not authorized to do so under the current bilateral.

Pan American's inaugural flight took in September touched off the controversy (ENR Sept. 16, p. 43). As Pan American made plans for the first flight, French officials notified the State Department that the aircraft might not be permitted to land at Paris unless the U.S. French bilateral was expanded to permit Air France access to the U.S. West Coast.

The fight took off under a cloud of confusion that still has not been resolved. However, it was permitted to land in Paris as were all following flights. TWA later inaugurated service without incident.

France closed the current bilateral between the two countries does not authorize U.S. carriers to fly the Polar route to Paris and that no such route was in the making when it was signed. U.S. authorities close the current agreement allows Americans the same route to fly from any point in the U.S. to designated points in France and that the French carrier can fly from any point in France to designated points in the U.S.

As France, with more continental route miles than any other airline in the world has long ranked a route to the West Coast, and several demands were made to review the agreement when TWA and Pan American began Polar service.

During the ensuing negotiations, France is expected to ask not only a West Coast route but also a Polar route to the Orient, with landing rights probably in Alaska. If the French do not obtain the rights from the U.S., they probably would seek them from Canada. Routes currently authorized under the bilateral are as follows:

- From the U.S. via intermediate points over the North Atlantic to Paris and beyond to Switzerland, Italy, Greece, Egypt, the Near East, India, Burma and Siam to Thaps and on to

- China and beyond. (This has been operated by TWA but not beyond India.) After Jan. 1, however, TWA will operate beyond India to Manila to connect with Northwest Airlines.)

- Over the North Atlantic and Spain to Marseille or Nice and beyond via Rome, Budapest and points south of the parallel of Budapest to Turkey and beyond. (This has been operated by Pan American, although all agreements have not been served.)

- Over the North Atlantic and Spain to Algiers, Tunis, and beyond via intermediate points to Egypt and beyond—operated by TWA.

- To Dakar, Freetown, Niamey, Bamako and beyond via intermediate points to the Union of South Africa—operated by Pan American.

- To Ganderque, Martinique and beyond via intermediate points to French Guiana and beyond in South America—Pan American.

- Via intermediate points in the Pacific to New Caledonia and beyond on one or more routes to Australasia—including Australia and New Zealand—Pan American.

- Via intermediate points in the Pacific and Manila to Saigon and beyond to Singapore and Batavia—Pan American.

- Via intermediate points in the Pacific: Manila, Hong Kong, Bangkok and Cebu to Hanoi and beyond via Siam to Burma to India and beyond—not in effect.

- From France via intermediate points over the North Atlantic to Boston, New York and Washington—operated by Air

France, with the exception of service to Washington.

- Over the North Atlantic and Montreal to Chicago—Air France.

- Over the North Atlantic to New York and Houston and beyond in Mexico—operated by Air France New York to Mexico without stop at Houston.

- From Martinique via Ganderque and via intermediate points to Puerto Rico and beyond via the Dominican Republic and Haiti to Miami (not approved).

- From Martinique via Ganderque to New York—not approved.

Counsel Would Reject Capital Fare Proposal

Washington—Civil Aeronautics Board has rejected and has not yet taken Capital Airlines' proposed reduced group fare plan to discriminate and should be rejected.

Capital proposed a reduced fare for groups of 25 or more traveling between specified points and originating or terminating on Saturdays or Tuesdays. The price of the proposed standing fare would amount to 16 2/3% of the one-way first class fare.

Counsel John M. Loftholm, in a brief to the CAB chairman, said the proposal, known for Capital's proposed group fares is to promote new and additional traffic with a resulting increase in profits. He said that while this may be a sound business consideration to support a reduced fare, it is not an adequate legal ground to justify a discriminatory fare.

The bureau counsel also said Capital failed to prove it can transport a group of 25 or more passengers at less cost than 25 individual passengers.



Caravelle Moves From Jigs

Prototype of French Caravelle transport aircraft (ENR Oct. 25, p. 41) scheduled for delivery to Norddeutsche Luftfahrt Service in 1959, stands out of jigs at Sud Aviation's St. Maurice de Truchat plant in Toulouse. SAS has ordered six Caravelles but an option on 10 more.

Pneumatic controls



AlResearch is the largest designer and manufacturer of pneumatic controls for the aircraft and associated industries. During the past 10 years more than 300,000 units have been produced and are in service.

Temperatures of the fluids (including gas and liquids) range from -400°F to $+2000^{\circ}\text{F}$ at pressures to $+6000$ p.s.f. The units operate at any ambient pressure at ambient temperatures from

-300°F to over $+1000^{\circ}\text{F}$. Line diameters range from $\frac{1}{16}$ inch to 15 inches.

This equipment is developed and tested in the finest pneumatic facilities in the world. Your inquiries are invited.

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SHORTLINES

■ **Air France** has begun a new Caribbean service which links San Juan, Puerto Rico, with St. John's Antigua, Pointe-a-Pitre, Fort-de-France, San Juan, Port-au-Prince, Georgetown, Paramaribo and Caracas. The service will run twice weekly. Air France also operates its non-passenger terminal at New York International Airport's new Arrivals Building on Dec. 5.

■ **Bozell Airways** declared a dividend of 10 cents per share payable on Dec. 31 to shareholders of record as of Dec. 17. At the same time, Bozell announced October earnings of \$267,473 as compared with \$133,514 for October, 1956. Ten-month earnings were down from the same period last year, they dropped to \$1,612,030 from \$1,710,690.

■ **British Overseas Airways Corp.** set a new company cargo record in the week beginning Nov. 13 by carrying 224 tons of freight from New York to the United Kingdom on regular passenger cargo flights. All the freight was carried on scheduled Boeing Strato-cruiser at Douglas DC-7C flights.

■ **Eastern Air Freight Corp.** declared a cash dividend of 10 cents per share payable on Dec. 20 to stockholders of record as of Dec. 6. In making the announcement, the board of directors established a semi-annual dividend rate of 25 cents per share beginning with the next payment. In addition, a 25% stock dividend was declared, also payable on Dec. 20, to stockholders of record as of Dec. 6.

■ **National Airlines** reports a net loss of \$101,190 for the first quarter of Fiscal 1957. The airline had \$11,177,479 in total operating revenues as compared with \$11,161,141 for the same period of 1957. \$11,995,357 in total operating expenses as compared with \$10,155,713 for the same period of last year. Net loss was arrived at after pre-tax loss was made by \$7,865,052 in depreciation and amortization charges and \$49,330 for deferred federal income taxes.

■ **Pacific Northern Airlines** has released 12 month figures on its Alaska routes which show that some of the losses served by the airline see more passengers arriving and not than those who remain in the town. Anchorage, with 45,000 persons on the line, had 27,141 persons flying in or out of Pacific Northern planes, while Kodiak, a community of 2,000 persons, handled 15,181 passengers.

AIRLINE OBSERVER

■ **Major factor** in United Air Lines decision to buy Boeing 707/720s instead of Convair 440s (AW Dec. 2, p. 42) was its desire to introduce jet maintenance on the Pratt & Whitney JT3 commercial version of the 157 United has been wary of introducing dual engine maintenance and, for this reason, had earlier favored dual engine Supermarine Strato-cruiser (AW Oct. 7, p. 35). The Convair 440 will be powered by General Electric C5815 turboprops, the Boeing 720 by a new lightweight version of the JT3, which will power the Douglas DC-8 already on order by United for transcontinental service.

■ **Losses** in the General Passenger Fare Investigation have had an apparent effect on airline business stock prices, indicating that investors have adopted a wait-and-see attitude to an unstable market. Since losses may be absorbed next summer, chances of airline stocks making any substantial recovery within the next future will be slight, particularly if year-end earnings dip as sharply as now anticipated (AW Nov. 18, p. 38).

■ **Nonstop** transcontinental passenger traffic is beginning to move upward after a disappointing November. Competition among American, TWA and United to capture a bigger share of the New York-West Coast market is rekindling the chief attention of airline heads. TWA last month launched an all-out "airbrush" sales drive in New York, using not only the local sales staff but also main trunk line aircrews to make door-to-door trips into the market with its Lockheed 1049s.

■ **Pan American** pilots have now officially announced to the public that operation of the carrier's jet transports will not be discussed until the crew complement problem has been solved (AW Dec. 2, p. 45). The pilot stand is taken on grounds that the second agreement between Flight Engineers' International Union and the carrier (AW Nov. 6, p. 35) "represents a direct conflict with ALPA policy as set by the ALPA Board of Directors." ALPA wants to do away with the flight engineer on jet flights, add a third pilot.

■ **United World Airlines** has been officially represented by the Civil Aeronautics Board for failing to obtain Board approval prior to suspending service at Chicago and Detroit on the carrier's international route. TWA has been authorized to support this service between New York and Los Angeles during the past three years but was "unofficially" failed to file a formal application for the suspension. In such a suspension, the new agreement with Airways but failing to wait for Board action on replacing direct service to Louisville and Pittsburgh with truck air service on Indianapolis and Cleveland, the Board wanted it was reported Congress for authority to issue fines in such cases. The Civil Aeronautics Act does not provide for the imposition of civil penalties against carriers which change routes without appropriate authority.

■ **Civil Aeronautics Board** has proposed amendments to Civil Air Regulations to prohibit scheduled international airlines and irregular carriers from taking off any aircraft when snow, frost or ice is clinging to the wings, static surfaces or propellers. A similar regulation has applied to domestic airlines for some years.

■ **Faster aircraft** and increased seating capacity are placing new demands on stewardesses by increasing time available for serving meals shift to a growing number of passengers. Turbine aircraft will increase the problem, but reports by American Wines, editors traveling on scheduled airline flights, note the reports indicate stewardesses can cope with the situation. Best time recorded thus far by American Wines was an 85 minutes at Eastern Air Lines flight when two stewardesses served a total of 37 passengers in 17 minutes.

■ **Civil Aeronautics Administration** has called for project reports for the 1959 federal airport program. Local government agencies wishing to participate in the 1959 program must file new project reports before Feb. 1. The Fiscal 1959 program, for which \$63 million has been authorized by Congress, will conclude the four-year federal aid approved by Congress in 1954.



UNMATCHED OPERATIONAL

FLEXIBILITY

THE NEW DOUBLE-DECK JET-PROP VANGUARD

Without a doubt, the new Vickers Vanguard offers the greatest operational flexibility of any airliner ever designed. Though it is a de luxe passenger liner first and foremost, the Vanguard can, when required, operate profitably as an all-range plane! Result: the Vanguard is truly a full-time money maker! Vanguards have already

been ordered by British European Airways and Trans-Canada Air Lines. BEA ordered twenty. TCA also ordered twenty—with an option on four more—deliveries to start in early 1960. Into each Vanguard will be built over 2 million flying hours of Vickers jet-prop experience. And experience has no substitute!

2 IN 1 AIRCRAFT



Because of its double-deck flexible design, the new Vickers Vanguard is actually two aircraft in one! Though it is first a de luxe passenger plane, it can also operate profitably as an all-range plane. Result: the Vanguard offers extraordinary operational flexibility—unmatched by any other airliner.

74, 96, OR 120 PASSENGERS!



The Vanguard's location upper deck passenger cabin features exceptional flexibility. It is built with capacities ranging from 74 to 120 seats, up to 120 also over for all-terrain flexible mount-down combinations in between.

32 TONS OF FREIGHT!



The Vanguard's four huge lower deck cargo holds have a capacity of nearly 1600 cu. ft.—enough to carry 32 tons of freight with no special bottom in the upper deck.

WIDE RANGE OF STAGE LENGTHS



The Vanguard can be operated economically on short, high density routes. And short as short as short—its all cargo section over a wide range of stages with full payload, the Vanguard has a 2100-mile range.

NO EXTRA-LONG RUNWAYS NEEDED!



The Vanguard offers great flexibility in that it is a jet airliner, yet has the extreme low wings of most transports.

The Vanguard's exceptional cargo features include fully automatic stability and maneuverability.

FASTER TURN-AROUND!



Special design features of the Vanguard cut time to the ground—lower operating costs in a maximum. A mid wing fuselage width of 74 feet and an efficient military style loading gate to use built water engines and wing flaps, make the Vanguard gate-to-gate in and out of the most crowded airports safely and quickly.

Cabin doors here and aft with built-in loading stairs means rapid passenger handling. Three wide cargo hold doors at each end, ground stairs, baggage loading and unloading. With its four low pressure, the Vanguard does not have to land in one or get broken apart at the open. All this gives the Vanguard more time where it should be—on the air!

GREATER SPEED, GREATER ECONOMY!



With four powerful Rolls-Royce Type 501 propellers, the new Vanguard will be capable of speeds up to 411 mph. It will have a demonstrated payload for even higher speeds.

Years of experience and careful study have proved that the greatest economy over a wide range of stage lengths is the jet-prop in turboprop.

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VANGUARD AIRCRAFT CO.
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jet-prop **VICKERS VANGUARD**

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MISSILE ENGINEERING



DOUGLAS Thor runs down launching pad at Cape Canaveral, Fla., in the payoff phase of the test cycle. Thrust lines discernible in rising column (60,000 lb. thrust Rocketdyne motor combustion chamber and shock waves).

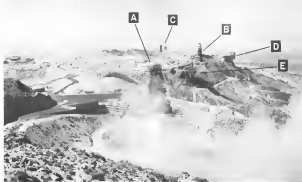


CAPTIVE tests of Atlas rockets are conducted at Spaceport Canon, southeast of San Diego. Test stand is designed was completed this year, that in background in 1956.

Static Facility Complex

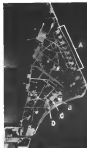


THOR launching pad and gantry crane are shown in the center of this photograph, taken at Patrick AFB, Florida. The storage facility in the foreground contains a supply of liquid oxygen.



BALLISTIC missile test stands at Edwards AFB include (A) captive test stand capable of withstanding 1½ million lb. thrust, shown during Atlas ICBM firing; (B) Atlas stand called "bottleup" because minute misalignment could be not two Atlas but heavy "bottleup" plate; (C) del used to check components; (D) captive test stand for Thor ICBM; (E) & (F) engine test stands for Atlas and Titan propellant.

Prepares Ballistic Missiles for Launching



STINGS of eight ICBM pads (A) at Cape Canaveral in 1958 ft. long. (B & C) are Thor pads. (D) is Jupiter launch site.



TITAN ICBM captive test stand at Martin Co.'s Denham facility is designed to accommodate "bottleup" type scale of heavy steel plate used to check out plowing and other components. Airjet propellant for Titan will be fired in this stand in the near future.

How Heat-Treatment Affects Alloy Steels

There are in general five different forms of heat-treatment used with hot-rolled alloy steel. These treatments modify the mechanical properties of the steel to suit the end use. Basically, heat-treating may be defined as an operation or series of operations involving the heating and cooling of steel in the solid state to develop the required properties.

The five forms of treatment mentioned above, as applied to constructional alloy steels, are discussed in the following paragraphs:

(1) **QUENCHING AND TEMPERING** usually consists of three successive operations: (a) heating the steel above the critical range, so that it approaches a uniform solid solution; (b) hardening the steel by quenching it in oil or water; and (c) tempering the steel by reheating it to a point below the critical range in order to effect the proper combination of strength and ductility.

(2) **NORMALIZING** is a form of treatment in which the steel is heated to a predetermined temperature above the critical range, after which it is cooled slowly to below that range in still air. The purpose of normalizing is to promote uniformity of structure and to alter mechanical properties.

(3) **ANNEALING** consists of heating the steel to a point at or near the critical range, then cooling at a predetermined rate. Annealing is used to develop softness in steel, to improve machinability, to reduce stresses, to improve or restore ductility, and to modify other properties.

(4) **SPHEROIDIZE-ANNEALING** is the prolonged heating of steel at an appropriate temperature, followed by slow cooling to produce a globular condition of the carbide. This treatment produces a structure which may be desirable for machining, cold-forming or cold-drawing, or for the effect it will have on subsequent heat-treatment.

(5) **STRESS-RELIEVING** is the process of reducing internal stresses by heating the steel to a temperature below the critical range and holding for a time interval sufficient to equalize the temperature throughout the piece. The object of this treatment is to reverse the elastic properties of the steel, or to reduce stresses that may have been induced by machining, cold-working, or welding.

Bethlehem metallurgists have had long experience in all methods of heat-treating. They understand the possibilities and limitations of each method with respect to various alloy steels. These men will be glad to help you with any problems concerning heat-treatment. Feel free to ask for their services.

And call on Bethlehem, too, for the full range of AISI standard alloy steels, as well as special-analysis steels and all carbon grades. We can meet your needs promptly.

BETHLEHEM STEEL COMPANY
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On the Pacific Coast, Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation, 3400 Broadway, Bethlehem Steel Sales Corporation.



BETHLEHEM STEEL

AERONAUTICAL ENGINEERING

Sabreliner Fits USAF Shelf Item Concept

By Irving Stone

Inglewood, Calif.—Prototype Sabreliner, North American Aviation's twin jet utility fighter, projected to meet Air Force requirements, is being pushed to meet a scheduled May 17, 1955, rollout date. First flight is targeted for the following month.

Design drawings are practically all related to manufacturing. Tooling is about 95% complete. Structures, skin and some detail parts already have been fabricated, and assembly work is getting under way.

Design and supporting groups, numbering about 100 people, are headed by project engineer Fred Pull.

Plane's Capabilities

Short—41 ft long, light—15,150 lb. gross, fast—500 mi/hr top speed, long-range—1,000 nautical miles, the Sabreliner has a basic capability of holding four passengers and crew of two. Plane's training and general capabilities are projected to include:

- Jet procedures and techniques.
- Single engine procedures.
- Jet transition training.
- Night and instrument flying.
- Navigation training.
- Radar observer and electronic countermeasure training.
- Tightturning and chase.
- General mixed intercept training with plane being used as a general tactical intercept target to simulate need for more sophisticated intercept intercept aircraft.
- Logistics support of combat aircraft.



DRAWING shows configuration of North American Sabreliner of the dual utility nature.

High speed of Sabreliner allows fast delivery of high priority spare parts and low maintenance potential. No pilot in U.S. would be faster than it in flying time.

• Aeronautics work—dropping fuel-air gas and other items until policy vehicle takes over.

Available Type

An Air Force specification for the plane type (official designation, UTX utility fighter) which the Sabreliner represents was promulgated in August, 1954. At that time requirements were set

for 1,000 to 1,500 of these lightweight two-engine jets.

North American will not comment but Armstrong Wynn has learned from a reliable source that in addition to the Air Force, it is likely that the Navy, Marine Corps and Army also will have a requirement for a plane of this type. At the present time, North American has no plans for continued operation of the Sabreliner. It is being projected only for the military market.

At the time Air Force specifications were promulgated, prices per unit requested for the UTX plane in the specifications was \$380,000.

North American is financing the Sabreliner prototype with its own funds, and cost of development of the final article may run as high as \$8 million. Pending acceptance of orders, North American plans to build but a single prototype, which will serve as a flight test article and demonstrator.

CAA Certification

In its specifications, the Air Force stipulated that plane should be suitable for CAA certification. North American has applied for a CAA type certificate and already has had several board meetings with CAA.

It is expected that the fastest engines, General Electric J85s will be type-certificated for 50 hp. because of which the prototype Sabreliner is ready to receive them.

At the time UTX specifications were



FUSelage-mounted engines were moved from original location in wing roots.

KEEPING UP WITH THE PROGRESS OF FLIGHT



As America's ascendancy in the world of aircraft and missile development created new and unprecedented demands for materials, Pioneer Aluminum Inc. responded with the establishment of the world's greatest specialized warehousing and supply facility. As a result, aircraft manufacturers, airline operators and military aircraft commands the world over today depend on Pioneer to meet their requirements for extruded aluminum extrusions, barrel sheet, regardless of specification or quantity. A huge floating inventory, comprising 2,000,000 lbs. of extrusions in more than 4,500 shapes; 2,000,000 lbs. of sheet and 1,000,000 lbs. of bar, offers an untold supply, prompt delivery and unexcelled service.



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speed, the Air Force also issued requirements for a UCN today, transport-a medium-weight multi-engine configuration. Requirement was met for 200-300 aircraft of this type. Lockheed Aircraft's CL-129 jetliner (AW Sept. 30, p. 106), a 10-passenger configuration which has already flown is aimed at meeting the Air Force specification. First prototype is powered with two Wright JT15. Second prototype, to be used as a test, is scheduled to be powered with four J65, although Fairchild's J65 also is a powerful power-

fully. Lockheed's UCN and North American's UTX are not directly comparable.

Finally, nose cone is plastic to accommodate glide slope and another side antenna. In the present version just off of the nose cone and just ahead of the cockpit, Collins Radio navigation equipment is installed. This includes glide path and lockout VIII communications, NAVICOR navigation, marker beacon, flight director system, autopilot and ADF.

Supported on a Robinson Aviation

Sabreliner Basic Data

Length	41.74 ft.
Height	16.45 ft.
Wing span	42.46 ft.
Wing area	376 sq ft.
Swing, 20% chord	28.5 deg.
Tail area	37.91 ft.
Passenger	4
Crew	2
Empty weight	5,115 lb.
Fuel (50 gal.)	5,123 lb.
Crew and passenger	3,280 lb.
Cargo and baggage	374 lb.
Gross internal weight	13,510 lb.
Takeoff distance (15,138 lb.) over 50 ft. obstacle	3,950 ft.
Landed weight	8,908 lb.
Top speed	390 kt.
Cruise at 40,000 ft. average altitude	496 kt.
Range with 60 empty and baggage (includes fuel reserve for 30 min. later at 30,000 ft. and 10% fuel reserve in landing)	1,236 naut. mi.
Range with two 120 gal. wing-type tanks fitted over landing edge	4,390 naut. mi.
Landing (headwind at 55 kt.) paved roll	3,100 ft.
Landing over 50 ft. obstacle	1,900 ft.



SINGLE-PIECE wing panel for Sabreliner has integral stiffeners rolled in. The skin panel reaches from the wing root to the tip.

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William D. Leonard, Inc.
373 South First Street, Portland, Ore.

stretch-mounted shell with integral cooling air passages, all this entire requirement is of modular construction for ease of maintenance. It is accessible from ground level through lift up hood type doors on either side.

Space beneath the radio compartment accommodates the dual wheel steering axle gear box.

Compact Cockpit

Cockpit and/or seats visibility. This is immediately evident when sitting in the cockpit's cockpit. Two foot gear (NBS/Victrol glass) form a V-shape. This is followed by two stretched/angle side panel designed

with flat air. Two top stretched/angle panels give good visibility and are complete with two smaller top panels for additional upward sighting in a bank.

Cockpit area is small but microhigh compact. Pilot has everything within reach, so that place can be reached completely from left hand seat. Instruments and controls in the cockpit have been made first by drawing on experience of North American test pilots and a wide group of military pilots who would be flying this type of aircraft if it were adopted for the service.

Control column is a complete assembly supplied by a vendor. It incorporates

when longitudinal and lateral adjustment mechanism, as well as rudder pedals, brake controls, gear lock and parking brake.

Single entrance and exit door is a plug-type seat. After a turn on the handle, the door is pulled in slightly, then it rotates outward and down to form a stairway. Door seats require needs of emergency escape and allows exit in event of a belly landing.

Escape hatch, 20 x 30 in., is centrally located in the floor between cockpit and cabin. It is covered with a retractable pressure-bearing door in the fuselage bottom. To use this hatch, plug-type floor panel first is raised. The external flap, which acts as a wind deflector, will also operate the drop tube to decompress the cabin. Pulling on the handle of the pressure-bearing door in fuselage bottom jettisons the door and leaves the opening clear of the speed brake for an flight bailout.

For emergency drop, pressure-bearing door would be removed before the flight begins.

A ground-escape emergency exit is located on the right hand side of the cabin area.

Opposite cabin door is a baggage rack. Alongside and aft of cabin door is a seat rack space. Prototype will not provide for buffet installation although room is available for it alongside baggage rack.

Seating Arrangement

In this basic prototype version are four 100-g passenger seats. Two on either side of the aisle frame, facing each other with room for a table between to facilitate conference grouping. Each seat is opposite a window.

Aft of cabin proper is a toilet area which also could accommodate a wash basin if desired. Pressurized area ends aft of toilet area.

Cabin is pressurized to 8,000 ft. at aircraft altitude of 45,000 ft. Pass seats have been made for emergency oxygen to be supplied automatically to each passenger. Oxygen will be stored at 1,500 psi and dropped to 400 psi when brought into regulator in pressurized area.

Regulator will meter it through a diaphragm control system. If cabin goes above 9,000 ft., manual control will turn on oxygen and automatically open access door to oxygen tank. Emergency manual oxygen can be used. As passenger maneuvers back from compartment oxygen will be turned on to the individual seat, in a manual type control on the inside with a button to send it to the floor.

Fuselage section aft of pressure bulkhead houses heating and ventilating equipment, batteries, and hydraulic res-



X-17
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METEOR"

... in TIME magazine calls the Lockheed X-17 three-stage re-entry test missile.

Developed by Lockheed for the Air Force Ballistic Missile program, the X-17 recently surpassed all known speed records for instrumented test missiles.

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ALTERNATE seating modes for right (top) is contrasted with the basic Suburban layout (bottom). This has four passenger seats, bulkhead, baggage compartment.

low for landing gear, speed brake and wheel brakes. In landing edge of door, where it meets fuselage, too, is an air inlet to heat exchanger for heating and ventilating areas.

Plastic bed cover houses secondary (STP) system, with primary unit also housed in plastic up on top of the vertical stabilizer.

Interior Arrangements

Alternate schemes for baggage interior are for cargo or higher density seating arrangements. By removing movable partitions, seats, and baggage and clothing racks, cabin interior may be converted into a cargo area accommodating up to 1,500 lb in units up to 25 cu ft (supported by door limitations). Seat belt-down fittings also serve as cargo tie-downs.

Through elimination or modification of baggage space, and area at comfort facilities, a higher density seating arrangement may be achieved to allow up to eight passengers.

Original Suburban design accommodated engines in the wing root. This has been changed to provide for pod-mounted engines supported horizontally from air frame sections. Change has required plan's abandonment of airframe, also facilities adoption of different pod-mount seats. Horizontal planes for jet engines are tied to heavy frame of the fuselage pressure cabin.

Safety Measures

While nacelle blade overlaps for pressurized area, the turbine section is at the of the pressure cabin to eliminate any possibility of failure in a case of turbine blade failure.

Nacelle minimum spacing from fuselage is about 64 in. Nacelle intake air ducts are wing leading edge by about 18% of wing thickness. Nacelle exhaust is ducted below overwing at an angle of approximately 5 deg.

Engine scheduled for the Suburban is General Electric J85, but the plan

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Lightweight power—the Bristol Olympus is an outstanding light weight power plant, it could well feature the fighters, strike aircraft, maritime transport, and so forth. Already the Olympus has been chosen to power 11 different aircraft being built in 4 countries. Shown here is the Olympus-powered Fiat CRJ lightweight strike aircraft—the NATO.



Warrior Two-type engine power Bristol Hercules, the world's most powerful engine, recently adopted in the making of Britain's air defense. The Two is a fully developed power plant, producing great power at high RPM, suitable for the engine air, and is also suitable for other power aircraft and fast vehicles.



Van der Vliet Hercules at 16000 ft. The Hercules, the world's most powerful engine, recently adopted in the making of Britain's air defense. The Two is a fully developed power plant, producing great power at high RPM, suitable for the engine air, and is also suitable for other power aircraft and fast vehicles.

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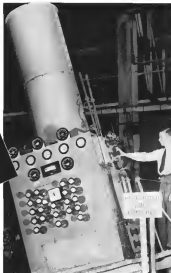
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will also accommodate Fordchels 135, (both engines deliver about 2,150 lb thrust).

The J51 can be removed with ease of a single M8 VIII type bench vise by loosening the postplant through the access door in the bottom of nacelle. Engine installation is easily accessible at just about shoulder level for any work or ground maintenance.

There is a self-sufficient engine starting system incorporated. This is a combination starter-generator on each engine, which draws power from alternators inductors. Engines also can be started with ground cart.

Wing Features

Low wing is tilted at 25.5 deg. at 25% chord line. Wing section has an x/c ratio 10/95. Aerodynamically optimized leading edge slots are employed, as in North American's F-86 and F-100 series.

Front tip to tip between front and rear spar, including center wing section box, outer wing is fuel tank area. Wing skins fabricated with integral stiffeners, ribbed in single patch from root to tip. Direct tip to tip fuel system to fuel is also incorporated in the common fuel tank box. Fuel system uses single point positive venting, located on underside of leading edge of right hand wing.

Main landing gear attaches to wing on spar, built around main wheel mounted under fuselage. Leading edge of wing and cowling are thermally protected, using ceramic blend.

All control surfaces—ailerons, rudder and elevator—are aerodynamically balanced and are actuated by a simple mechanical control system. North American's philosophy has been to improve maneuverability in air also normally requiring considerable attention. For this, active stabilizer is electrically actuated. On rudder and elevator there are electrically operated trim tabs. Landing gear flap also are electrically actuated.

Structural Details

Fuselage incorporates four main structural longbones continuous from just aft of plastic nose back to plastic tail cone.

Two of these longbones run right above height of wing center section box. Upper longbones are at upper portion of clipped fuselage.

With exception of plastic bulkheads, frames are continuously formed about 25 in wide and spaced, generally, on about 9 in centers.

Major bulkheads located at forward end of plastic cowling, forward end of main entrance door and at wing front and rear spar positions. It built up of sheet metal, extrusions and machined fittings. All pressure

bulkhead is bonded all metal aluminum after heat-cure bonding. It adds too in serving as a pressure barrier. The bulkhead also serves as main support member for engine pylon.

Heavily coated bulkhead of fuselage rear supports vertical stabilizer air horn and serves vertical stabilizer leading edge structure. This bulkhead also has fittings to support horizontal stabilizer rear beam, on which stabilizer is pivoted.

Floor is primarily composite and is bonded all metal aluminum honeycomb sandwich.

All fuselage skins are chemically treated to provide light coat with ad-

quate bond areas for rivet attachment. Channal sealing starts with a 30:1 mix, sheet to provide for bond areas of this dimension and others the extend down to an average thickness of 0.10 in.

Winged Spars

Wing structure is somewhat similar to that used on North American F-100 and F-107. Front and rear spars are riveted, with webs varying from 0.75 in. thickness to about 0.34 in. thickness. Rear spar web is bonded, used to support leading gear, is about 1.25 in.

Basic wing ribs are sheet metal hydrogen formed. Mechanical joints

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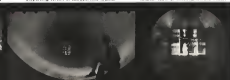
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Exterior view of one sphere and support necks



One of two 38 ft air storage spheres

Dispersing screen at exhaust line muffler



Interior view of diffuser, forward nozzle

include outboard rib at end of wing box, inboard rib of outer panel, and board rib of inner section and ribs on engine structure.

Integrally stiffened wing skin on single sheets of 7079-T6 aluminum tapered from about 0.03 in inboard to about 0.10 in outboard, the same as spars.

Selection for making integral fuel tank is made at first joint on F100 C, D and E. Wing boundaries, nose-to-front and rear spar and out rib—have a unified groove to accommodate sealing compound. At locations where the skin is hinged to the frame structure, this groove is locally reduced to conform to provide a continuous path for sealing compound around the latter. Sealant (T-taped) paths is injected through small holes located near every third bolt, after the wing box is closed.

Injection hole in E-fuel with a self-tapping screw to ensure the sealant. With sealing procedure gives a continuous barrier against leakage of fuel from the integral tank.

Cockpit Instruments

All units on cockpit panel are visible visible from each seat. On pilot side, instrument panel has Machmeter, sensitive airspeed indicator, Collins Flight Director, turn-and-slip indicator, turn coordinator, altimeter, rate-of-rotate indicator and clock. Also, another beam light, turn-and-slip indicator, compass, three indicators, switch for testing for warning device, and landing gear position light.

Instrumentation for each engine includes exhaust gas temperature indicator, turbocharger, fuel flow and oil pressure gage.

Radar panel is center has VHF transmitter, two VOR receivers, weather radar and automatic direction finder.

On copilot side there is fuel quantity and switch, fuel quantity gage, O₂ and O₂ indicator, pressure O₂ and O₂ indicator, flap position indicator, three turn-position indicators, turn rate of climb, turn pressure and differential pressure.

Autoland panel carries low air temperature, emergency VHF transmitter, sensitive airspeed indicator, turn position, attitude gage, turn-and-slip, turn indicator, turn rate of climb and turn rate of climb.

Engine controls are pedestal-mounted between the two seats.

Small overhead panel, located on underside of top window, control frame carries clock, turn for landing and take off, electrical master switch, outboard light switches, engine controls and a navigation panel which is locked to master control lights in front of pilot and copilot.

University Presents Space Law Lectures

University of Colorado's University Extension will present a series of lectures on space technology, in cooperation with Kansas-Woodbridge Corp., at Los Angeles San Diego and San Francisco, beginning Jan. 11. Course is a three-unit credit of available at either San Diego or Los Angeles. A bachelor's degree in engineering or science is a prerequisite. Lectures held in San Francisco is a non-credit lecture although certificates of attendance will be awarded.

Ann of the series is to provide a sound exposure of fundamental principles of very long range ballistic vehicles, derivation, their quantities, laws which are equally related to space flight.

Series of lectures has top authors has in their fields, including space law, nuclear propulsion, nuclear power, nuclear waste and once with major responsibilities in the American satellite program.

Information on lecture topics and the various lectures may be obtained by writing University of Colorado Extension, University of Colorado, 24 Cold.

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Test data shows no measurable change in efficiency of General Electric Hydraulic Constant Speed Drive after 500 hours of operation. The drive was operated in a typical aircraft speed and load schedule with inlet air temperatures from 280° F to 345° F.

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THOUSANDS OF HOURS of operational time, after these test results, prove the outstanding reliability and long life of General Electric Hydraulic Constant Speed Drives. These drives can be used with any 480-cycle a/c generator on piston, turboprop, or turboshaft engines.

COMPACT AND SELF-CONTAINED, a typical 20 KVA drive measures 8 1/2 in. long and 1 1/2 in. in diameter. It weighs just 23 lb. A typical 40 KVA drive measures 12 in. by 13 in. and weighs 32 lbs. A self-



BALL PISTON drive assembly is well within tolerances when ball piston test is shown by precision air gauge.



THE DATA shows no measurable decrease in efficiency of G-E hydraulic constant speed drive after 500 hours of operation.

contained mechanical generator system provides steady state speed control to $\pm 1\%$. Free frequency control to $\pm 1/16\%$ and automatic paralleling can be provided. For more information on these drives and other products of the Aircraft Accessory Division Department, contact your G-E Aviation and Defense Industries Sales Office, or mail coupon.

Circle 333-13, General Electric Co., Indianapolis 5, New York

Please send me the following hydraulic constant speed drive literature:

- ☐ Description Bulletin, GEA-1374
- ☐ Theory of Operation, GEA-1480A
- ☐ Immediate product ☐ Reference only

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Helicopter Stabilization Gains Test Hours

By J. S. Betz, Jr.

Backup Case—Complete head-off stability for helicopters provided through an electronic system has been found feasible and reliable in large scale use to over 60,000 hr of operation in 200 Navy helicopters. Reliability of the electronic automatic stabilization equipment (ASE) is indicated by the fact that it is required more than 250 hr use without a crew malfunction of any type and more than 500 hr without complete loss of the system.

The stabilization units receiving this tough service test were designed by the Sikorsky Aircraft Division of the United Aircraft Corp. and are being incorporated in all new Sikorsky helicopters for the Navy.

Weather Barrier

Head-off stability has been the primary stumbling block to all modern 24 hour helicopter flying which could mean nearly making the full potential of rotary wing aircraft. The stability and flying ease of helicopters has been greatly improved in the last 15 years through the addition of servos to reduce control forces and various mechanical changes in hub design. Despite very good progress in this area, helicopters have inevitably remained unstable in calm and a good deal of physical effort has been required from the pilot during all flight conditions.

Continuous effort of this control effort plus the long observation of instrument flight has kept bad weather and night flight from being serious with helicopters. Instrument flight is most unsafe during low and at low forward speeds. For most military and civil operations instrument flight is still an emergency procedure.

Automatic stabilization equipment has delayed the stability problem so that the helicopter is capable of being flown for completely head-off flight at all forward speeds. Two general approaches have been taken in stabilizing helicopters.

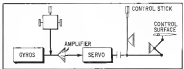
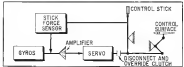
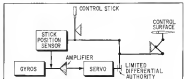
- Completely mechanical systems
- Electronic systems

Electronic systems assemble into pilots for fixed wing aircraft, but are more completely integrated into the helicopter control system. To date they have generally been more successful than the mechanical systems. Primary drawbacks of the electronic equipment has been its complexity and a reliance on its reliability under operational conditions.

Results of service use of the Sikorsky system with only one complete failure of the unit recorded yet 580 flight



NAVIGATOR automatic stabilization equipment has been tested on 1855 helicopters (shown) for the Navy. Rotational updrafts, such as used constantly in flight. Lower silhouette (below) shows typical fixed wing aircraft, centered by and secondary control stick at left. Profile type ASE (center) for helicopter eliminates this secondary control, reduces control forces during ASE operation. Blocky view type ASE (above) eliminates the control stick movement and gives the ASE only limited authority over the controls.



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SPEED YOUR MISSILE
Precision Welded Stainless Steel,
FROM THE LEADING PRODUCER

PROGRAM WITH
Titanium and High-Alloy Parts
OF JET ENGINE COMPONENTS

Here's how you can stretch your present overloaded engineering and production facilities on missile projects . . .

Use the experienced designers at the Jet Division to develop structures, tanks, and other air-frame parts of your missile . . .

Use the complete facilities of our sheet-metal shop, welding shop, and machine shop to make these missile components . . .

Let our experienced tool designers and skilled press operators produce precision forgings in steel, titanium, and high alloys for the hardware on your missile. These forgings are so accurate in dimension and contour that most finish machining can be eliminated.

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WRITE FOR BOOKLET AW-557

which describes the experience, facilities and personnel of the Jet Division



JET DIVISION
Thompson Products, Inc.
CLEVELAND 17, OHIO



DAMPING DONE EASY

Lyndon's new model 1041 auto-
lightweight control stick dampers
consistently rated at 40 lb. or
under/linear. They can be
modified to produce linear or
linear damping rates to suit.



Write for literature to Lyndon 1041

Anything easy when you know how —
and LYNDON KNOWS HOW through long
experience in solving damping problems.

Through utilization of the self-contained
only control principle, the Lyndon damper
control system is in proportion to input
applied by the aircraft control system.

Control specifically to fulfill the need for a
more reliable damper with optimum linear
relationship. Lyndon's dampers thoroughly
field tested. It is unaffected by operating tem-
peratures from -100°F. to +100°F. and is
qualified in accordance with specifications
MIL-E-32124.

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It would mean a good record for a new
electronic mechanical device of consider-
able complexity.

Slater's experience has shed some in-
creasing light on electronic actuated
controls in general. Slater's experience
is that the main danger from work with
the system has not been with electronics
but rather with the mechanical design
and quality control of the rest of the sys-
tem.

First instant of action against failure
was relay, with mechanical
interference of the system. Slater's
Vane tubes proved much more reliable
than they are generally given credit for
but they were the bad area of unreli-
ability. The other type failures ex-
perienced can be improved by better
design, but vacuum tubes remain un-
derstandable. It is hoped that transition
will improve the situation.

General reliability of the system was
proved in large measure because the
Navy Bureau of Aeronautics directed all
helicopter pilots to use electronic tube
systems continuously if their helicopter
was so equipped. The effort was to be
guaranteed if the system did not func-
tion properly. This limited that auto-
matic stabilization equipment would
get a quick and thorough evaluation
and that flying and maintenance per-
sonnel would become proficient in its
use.

Pilot acceptance is reported to be
excellent because of the pilot's fatigue
reducing quality and its reliability.

Instrument Flight

The new and reliable stabilizer that
automatic stabilization equipment pro-
vides for helicopter means that full in-
strument flight is possible now with
standard fixed-wing instruments. New
instrumentation is being developed to
make this type of flight easier.

All helicopter operators stand to
benefit greatly from this work. The
Navy wants to use the helicopter, which
has proven to be a very effective air
vehicle recently, as a 24 hr. vehicle.
The Army wants to insure helicopter
transportation on a round-the-clock
basis. It would eliminate fixed-wing
aircraft, for instance. Commercial
operation will have an alternative pas-
senger vehicle once business heli-
copters are available. Search and rescue
operation will become more effective
to aviation only a day of the possi-
bilities of the stable helicopter.

Development of electronic automatic
stabilization equipment has taken two
paths, both different from a normal
autopilot. The system is an integral
part of the normal helicopter controls.
The main difference between the
pilot between the automatic stabilizer
system and the normal autopilot
are:

• Autopilot is controlled by a knob or

stick, separate from the main controls
of the aircraft.

• Fuelled type automatic stabilization
equipment moves the entire helicopter
control system including the pilot's
seat, to maintain a given attitude.

• Sailer type automatic stabilization
equipment does not move the pilot's
seat as it keeps the helicopter in a
given flight attitude.

Slater's equipment is the latter
type, which requires much less power
to operate than the fuelled and is con-
sidered to offer a significant weight ad-
vantage for a single rotor helicopter.
The Slater's system adds only 60 lb.
to the normal weight of the control sys-
tem.

The Navy has specified that auto-
matic stabilization should maintain this
system be installed on some of its
new helicopters. However, in further
development to provide more sophis-
ticated functions a combination of the
series and parallel systems will probably
be used. Near present, Slater's and
some other contractors are working on
this combination.

Series Operation

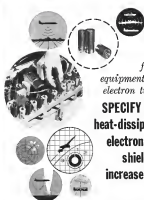
To insure that the series system never
picks the helicopter into upset attitude,
control and damping attitude it has
limited authority over the control sys-
tem. It can only move the cyclic control
system through 10% of its total
travel to return an attitude that the
pilot gives the helicopter. To maintain
attitude the system can move 15% of
collective pitch travel in one it can
change the pitch of the tail rotor
through 15% of its travel to maintain
heading.

While modifications of the series
equipment still exist and the system
may give the controls a "dead-end" feel,
it is well within the capability of
the pilot to correct it.

Until recently rotors and similar
equipment were furnished in airframe
manufacturers by the government and
the airframe builders were not responsible
for the performance of these units.
Slater's developed its automatic stabiliza-
tion equipment as a part of its
obligation as prime contractor on the
HSS helicopter. This unit with some
experience from instrumented motion.
However, the Slater's design used
servo gear not purchased from instru-
ment and equipment manufacturers to
Slater's specifications.

The very intimate relationship be-
tween the helicopter, its control and
its automatic stabilization equipment
was developed by the prime con-
tractor to meet effective.

It would be the HSS cannot be selected
as operational one. It may lead to even
greater responsibility for the prime con-
tractor in helicopter purchases by the
government.



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diameter tolerances.

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reliability for eliminating electron tube failures commonly caused by
heat, vibration and shock!



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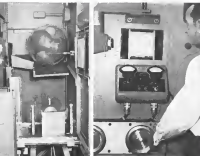
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Heat-dissipating electron tube shields for maximum equipment life and greater safety



PLASTIC sphere (left), containing a metal casting held in position by rubber balloons, but not rolled down close to movable platform (back) holds casting between fluoroscope and viewing screen in control cab (right). Cab is shielded to protect operator from radiation. Camera at left of viewing screen can be swung around to photograph fluoroscopic casting.

Fluoroscopic Castings Inspection Spots Gas Holes, Sand Inclusions

Dallas-Fluoroscope inspection of magnesium and aluminum castings has been evaluated for the Navy by Chance Vought Aircraft, Inc., and the company has found that fluoroscope can be used to inspect or reject use of Navy inspection.

In its report to Naval Ordnance Laboratory, Chance Vought recommended that fluoroscope replace X-ray on a 100% basis for certain castings, and the test program indicated that the process can also be valuable in inspection of stainless steel braided honeycomb material.

Chance Vought has been testing a high intensity fluoroscope for the Navy since February, 1955. The machine was developed by Naval Ordnance Laboratory, and the company operated the castings program at the request of Bureau of Aeronautics.

Fluoroscope Layout

Fluoroscope was installed in a booth layout for Chance Vought's test program. Castings are put in plastic spheres and rolled down a slide to a movable platform which holds the casting between the fluoroscope and the viewing screen in the control cab. The

casting can be rotated by remote control from the control cab and then can be repeated views at angles. Castings are removed through a remote chute when the inspection is completed.

Control cab is shielded to protect the operator from damaging radiation. Cab contains instrumentation for the fluoroscope and controls for moving the castings. Cab is also equipped with a camera which can be swung in front of the viewing screen to photograph the fluoroscopic casting.

Test Program

Two tubes were used in the test program—the Super Dynamat, Focal spot 1 mm, 900 KVP-MA, and the Special High-power Madiatt tube, Focal spot 3.5 mm., 4,000 KVP-MA. Screen was the Kodak E with an unsharpness reconstructed of 8.1 mm., and power supply was a General Electric transformer with 1,000 KVP-MA rating. Station also has a duplex voltage control, and self-regulating in automatically adjusted to maintain constant power output to the tube.

Clear plastic spheres are used to hold the castings. Small rubber balloons are

Aeroquip Engineering Notes



The Aeroquip 3200 Self Sealing Coupling described in the advertisement at the right is designed to meet the new military specification MS-C-25427. This specification requires the coupling to be arranged so that if it is not fully connected and locked, it will automatically seal upon part.

Since we wanted a coupling which could be connected against pressure that might be present in an hydraulic system, we chose to use a quick/lock thread as the connecting means. The length of the thread is such that the valve is drawn into the coupling before part if the coupling nut is not turned far enough to be fully locked. These threads also provide sufficient mechanical advantage to permit the coupling to be connected even though the system is under pressure.

The first kind used in the design requires the locking mechanism to be capable of withstanding a large percentage of the maximum force developed between the coupling halves under system pressure. While this kind on the locking device is not entirely suited to the smaller sizes of couplings, it does give to appreciable proportion on the larger sizes such as the -12 and -16. So it is a wise to consider the full range of sizes when evaluating a coupling design of this type.

The new military specification assumes the coupling will be used in the connected position only. Our experience has indicated that it is often advantageous to use hydraulic coupling a variety of valves for test and also service. Therefore, we have designed the Aeroquip coupling to start either by a full turn of at least 30,000 cycles of the impulse and vibration test.

To sum up then, the Aeroquip 3200 Self Sealing Coupling will seal upon part if it is not fully locked when connected. It can be connected against pressure. The design for connecting and disconnecting can easily be done through the full range of sizes. The halves can be used separately at full system pressure. And, the 3200 Self Sealing Coupling is available with either MS or AN standard tube connectors.

Pittman
Vice President
Aeroquip Corporation



AN AEROQUIP FULL TURN LOCK NUT SECURELY CONNECTS THE COUPLING. There is no loss of fluid, even when system is pressurized.



COUPLING HALVES SPUN APART WITH VALVE CLOSED. Lock nut remains closed partially and coupling is reconnected.



A SINGLE TURN OF THE LOCKING NUT CONNECTS COUPLING HALVES meeting full flow of fluid. There is no air inclusion. Valve is not closed for locked position. It is by turning profile of locking nut, by a turning to turn the gear up, or by turning on the internal force line. The coupling cannot unlock accidentally during normal service.

Aeroquip

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AEROQUIP CORPORATION, WESTERN DIVISION, BUREAU, CALIFORNIA
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Aeroquip 3200 Series Self-Sealing Coupling

FOR 3000 PSI. SYSTEMS

- **SAFE** . . . may be checked visually or acoustically for locked position.
- **SIMPLE** . . . valves contain only 2 moving parts.
- **FOOLPROOF** . . . there is no shutoff immediate position where the coupling is partially open and unlocked.
- **NO FLUID LOSS** . . . the Aeroquip design prevents fluid loss during connection and disconnection.
- **NO AIR INCLUSION** . . . the coupling cannot admit air into the fluid system during connection and disconnection.
- **Designed to meet the requirements of military specification MS-C-25427.**

Before the coupling is used for aircraft fuel, testing. Before AB-17 going into production.

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 Name and address for Bill of Materials _____
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 Company _____
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Note: to precision-minded men at McDONNELL

Tactair valves surpass the tightest requirements of manufacturers and the Armed Forces on civil and military aircraft. One reason is custom design in close cooperation with your engineer. Another is the fact that every valve employee at Tactair works on quality control.

Cost in cents: the economical 4-way, pneumatic actuator valve with non-interflow characteristics. Tactair engineering gives it essential compactness and light weight. It has very low leakage, positive operating stroke, unusually low operating torque at full pressure, and a unique safety release on stroke.

Results: substantial saving of space and weight in aircraft—plus dependable performance under critical conditions—both at a realistic price.

Remember: no standard or special components, we welcome a challenge to solve your most precise valve problem. Every job we do is done on a personalized basis and backed by our warranty of responsibility. It has been that way for 16 years. Tactair Valve Division, JanSport Products Company, Bridgeport, CT. BR6000 or 3-1100.



CONTROL, SELECT, BRAKE, RESTRICT, CHECK... with

TACTAIR



CASTING ends on bellows in plastic form; plastic, fluorocarbon shows how these most bellows are produced to repeat casting.

employed to suspend the casting inside the sphere. System will handle items up to a maximum size of 12 in. While the machine was designed in 1971, it was found that 95% of castings would fall in this size range, and today probably 10% are still in this category.

During the evaluation, Chance Vought inspected 2,000 random-flow stemware and suspension castings to get a comparison between X-ray and fluoroscopic techniques. All castings tested had been previously X-rayed, and X-ray-accepted castings were scattered through the test lots so the fluoroscope operator didn't know the X-ray evaluation of the castings he was inspecting.

Cost analysis of the two techniques was made by timing fluoroscopic inspection of 15 castings, then multiplying by two, since two operators are required to work the system. Costs cited in Chance Vought's report show savings of 14-18 cents per fluoroscopy, while costs of X-raying the same castings ranged from 20 cents to \$1.90.

Better Than X-Ray

Chance Vought also inspected 150 pilot tubes for ocular embolization of voids in the tubes. Company found fluoroscopy, more effective than X-ray for the job and noted that fluoroscopy inspectors could be accomplished while the tubes were in their shipping containers.

Among disadvantages of the system, Chance Vought noted the fact that the plastic spheres used are fragile and break easily. C. R. A. S. Clavette, assistant regional engineer in charge of the program, notes that as operators can inspect about 70 castings an hour with the present plastic sphere technique. He estimates that 100 castings could be inspected in an hour with a suspended, handling technique—can be a set of accurately controlled hands under to these used in chest research.

During the tests, 18 of the 121 castings rejected by X-ray were also rejected by fluoroscopy. The remaining 45 castings rejected by X-ray had micro-voids which couldn't be detected by fluoroscopy. But fluoroscopy also rejected 125 castings not rejected by X-ray. These castings had gas holes and used techniques that X-ray had missed. Chance Vought is now installing a new Divanair 120W tube supplied by MacVitt Laboratories to give the system capability of detecting micro-voids. Test program will be finished in about three months, after Chance Vought has run 1,000 castings through with the new tube.

As a result of the test program, Chance Vought reported that fluoroscopy can be safely used to replace or reduce X-ray inspection. For Class IA, MIL-C-2021 castings, it is recommended that fluoroscopy be used on a 100% basis, but that X-ray be used on a 10% sample of the castings as a means of double checking. Report recommends a complete switch from X-ray to fluoroscopy for Class 1B, MIL-C-2021 castings.

No intensive testing was done on stainless steel based assemblies, but test data indicates that fluoroscopy would be superior to X-ray inspection for this type of material.

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Typical sample of bellows for testing your requirements to provide manufacturing in order the production of prototype phase of your program.

Specialty built Kwik-Turn Valve 1/8" with three dimensional Hydraulic. Automatic reclocking a component. This variable purchase size 1/8" Tron Spine to follow a "Coarse Mount" and with flexible complex, contract and, design.

(TYPICAL SAMPLES OF FLUOR SCOPED REVELATIONS)

Illustration: (Note: The Tactair valve was used, one for anti-rust valve (any night) and the other for anti-rust valve (any night) for building, precision assembly, etc.)

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to the standards of Resistoflex Reliability,
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Nose Cone Will Be Army Satellite

Pandora, Calif.—Arm's planned satellite (AW Nov 25, p 33) will not separate from the host stage until after launch by a slightly modified version of Arm's Jupiter C multi-stage ballistic missile test vehicle.

Dr. William H. Eckert of Jet Propulsion Laboratory, California Institute of Technology, reported that the satellite's launching is scheduled for sometime between the first of the year and the end of March.

Following and Jet Propulsion Laboratory has assumed a role in the Army program equivalent to that played by the Naval Research Laboratory in the Vanguard program. Jet Propulsion will design the host two-stage launch vehicle launching tank and will modify the satellite instrument package to fit the rocket.

Instrumentation pointed in shock absorbing foam plaster will be formed to

a bullet shape to fit within the steel nose cone of the final rocket stage. Effect on instruments of heat transfer from rocket motor and stage for uniform visibility regardless of visual angle which Jet Propulsion will choose a segmented, polished sphere are not considered important in the Army-Jet Propulsion Laboratory project.

Instrumentation in the Jupiter launched satellite was formerly Package 1 in Vanguard program. Missions exist in a remote up study by the State University of Iowa under the direction of Dr. J. A. Van Allen.

It will be replaced in the Vanguard program by a study of the earth's induction balance by the University of Wisconsin. Package 2 weighs about 38 lb., will be slightly over 12 in. long. Its average diameter will be about seven inches.

The Army satellite will carry two



C-130 Makes Rough Field Landing

Lockheed C-130, being tested by the Air Force at Eglin AFB, Fla., with a 14-in. ditch as rough during a rough field landing demonstration. Weight of the aircraft was 121,000 lb. Though the Hercules was designed for short, hardy prepared airfields, it was not originally intended to land on this type of terrain.

METERS PER SECOND

at 1000 psi

30

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at 350°

Part No.
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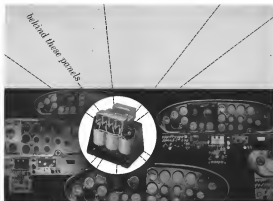
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of every
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Constant, dependable power is a must for lighting, instruments, radios, heaters, window heating, and other functions in commercial and military aircraft A-C systems. Combining full power ratings with minimum size and weight, the Westinghouse aircraft power transformer provides efficient control of the distribution voltage.

Reduced size and weight is achieved by a combination of Class H insulation and constantly improved Westinghouse grain-oriented silicon steel for cores.

Easier installation and maintenance are assured by isolated terminals, boards, and sections. This feature permits an additional weight reduction, too.

Peak cooling efficiency results from the open type construction, which also eliminates weighty bearings and filling compounds.

This transformer meets all environmental, overload, regulation and efficiency requirements of Air Force Specification MIL-T-5215, as well as the typical individual requirements. It is listed at 1½ kva, 3-phase, 200-420 cps, 200/115 volts, full load. Contact your Westinghouse representative, or write Westinghouse Electric Corporation, Specialty Transformer Department, P. O. Box 221, Greenville, Pennsylvania.

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transmission. One will be the standard Vagueval transmitter with an output of 100 milliwatts that can be received by the Marlock receiver, and by amateur radio operators. Signal is reported to last for two or three weeks. The second will be jet Propulsion Laboratory's Marlock system also transmitting on 100 mc, but at a power of only 10 milliwatts. Low power level and long range are obtained by using bandwidth of only a few cycles.

Because of low power requirement, Marlock transmitter is expected to send for several months. Americans will be unable to pick up the signal because of the unusual receiver sensitivity needed. Marlock receiver uses phase lock system to get this sensitivity. It is well built a network at three or several meters. Marlock system was designed about a year ago. Transmitter weighs one-half pound, batteries weigh one and one-half pounds.

A later Army launching may put up a 1,300 lb satellite. Receiver first stage and Thakel Blumstein as second and third stages would be replaced by production configuration of Jupiter and Mercury in second and third stages.

Britain Reviews Aircraft Programs

London—British defense officials now are carrying out a thorough review of the various military aircraft programs.

The Ministry of Defense says the review is designed to keep the number of British aircraft projects to the minimum consistent with security.

This is stated in reply to a House of Commons subcommittee, which last January severely criticized British aircraft procurement methods (AW Jan 28, p. 25). Research and development facilities are being studied with the object of merging establishments wherever possible, it is said.

The review is also being undertaken due to changes in defense programming outlined at last February's White Paper. A defense of post-British aircraft procurement policies is put forward in the report.

Noting negative criticism of what it regarded as an extraordinary number of helicopter projects, the Ministry of Supply replied:

"No work on helicopters had taken place in the United Kingdom during the war so that a good deal of know-how had to be made up of very service and civil requirements prior to be met with British designs."

It said that of the 10 helicopter projects referred to by the committee, three have been abandoned, four have resulted in production aircraft and three are still under development.

The subcommittee strongly criticized

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• control systems	• control systems	• control systems	• control systems



Bill Remmert bought R-W service to Pompano. Below, left, a DC-4 conversion near completion.



Bob Werner works most of his time at Remmert-Werner's home-base operation in St. Louis.

Remmert-Werner... Big-Change Artists

*Over 200 aircraft conversions . . .
thousands of corporate planes maintained
and serviced . . . millions of gallons of Shell
Aviation Fuel sold to satisfied customers—
that's Remmert-Werner's 10-year record!*

In June '58, a caravan of three giant mobile units left Remmert-Werner's home base, Lambert-St. Louis Municipal Airport. It was headed for Pompano, Florida.

Bill Remmert met the caravan. Utilizing its complete machine, woodworking, and electrical shops plus radio racks, stockroom and expert mechanics, he established another R-W staffed base.

"When we took over the Pompano field," recalls Bill, "we needed fueling equipment—fast. Shell engineers came down and dropped our bulk plant. And almost before we knew it, there were the three 15,000-gallon storage tanks we ordered waiting out there on discards, ready to go. Shell helped us soon into business."

Besides servicing a good number of America's 28,000 corporate planes, Remmert-Werner also converts surplus commercial and military aircraft into luxury planes for private owners and corporations.

In an ordinary conversion job, R-W rips out every bit of wiring and piping, and installs completely new systems to customer specification. Lounge chairs and sofas, tables, lamps, galley and any other special furnishings are designed and built by R-W craftsmen.

Among the organizations that happily fly Remmert-Werner conversions are Olin Mathieson Chemical, Grumman Aircraft, Hercules Powder and Owens-Illinois Glass.

"It didn't take long for us to find out that when you're a Shell Dealer, business flies your way," says Bill. "Shell works right along with you, helping you build your business. They've even helped us locate old DC-8's when they've been hard to

get. A Shell man spotted some while traveling in Turkey last year. We went right over there and bought them. Most of these '3's have already been converted into flying yachts."

If their first 16 months at Pompano is any indication, Bill Remmert and Bob Werner are on their way to making R-W service available to America's ever-increasing fleet of corporate aircraft.



Before: C. B. Woods (right), R-W sales manager, and client discuss plans for a Grumman "Ducan."



After: R-W craftsmen finish converted "Ducan" with Shell Aviation Gasoline.



Before: R-W craftsmen rebuild interior of DC-8. They'll install new wiring, food bins, picture windows, and furnishings to order.



After: Three Remmert-Werner craftsmen complete interior. R-W conversions sell for as much as \$200,000.

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that measures the RPM — to control the speed

for best approach — to touchdown



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INSTRUMENT CORPORATION
WHITE PLAINS, NEW YORK

waste in the Supermarine Swift program, labeling the aircraft a \$90 million failure. CF has charged the Ministry of Supply says.

The Swift was a failure on the score that it proved impossible to develop the aircraft to an acceptable performance in the main roles for which it was acquired within an acceptable time. During 1952-1955 troubles encountered in development were not always greater than those normally met in the development of an advanced aircraft and it was expected that they could be overcome within a reasonable time. Moreover, during most of the period the difficulties encountered in the development of the Huston aircraft, if anything, to be the greater.

"Orders for Mk. 3s and 2s were reduced to very small numbers by the middle of 1955 when it was clear that these aircraft would not fulfil most of the operational requirements."

The Ministry was ordered for Mk. 3s, 4s and 6s were cancelled in February 1955. At times as flight tests had shown that there could not be brought to an acceptable standard without mass intensive development, they could be justified in the circumstances. It notes that the Mk. 5 is as serious as a reconnaissance aircraft.

The Ministry says it has now adopted the "development bank" system of the U. S. Cook-Craig plan, crediting this as one reason why American fighter development is ahead of Britain. The Ministry claims that bomber development in the two countries takes about the same time.

Meanwhile, three prominent members of the assault industry have put their views about the effect of defense reductions before the parliament and scientific committee of the House of Commons. They are Dr. A. E. Russell, director and chief engineer of Bristol Aircraft; H. G. Nelson, managing director of English Electric; and Sir William Farnes, technical officer for A. V. Roe.

Dr. Russell suggested that in view of the phasing out of fighters and bombers substantial governmental support is needed to prevent the industry from falling behind in the development of civil aircraft.

Regarding British plans for a supersonic aircraft, he said it is possible that an economic solution may be found not at low supersonic speed but at speeds in excess of Mach 3.

Nelson suggested a new government agency be set up to administer a national policy for civil aviation.

Farnes disagreed with those who have written off the future of manned aircraft in favor of the guided missile. "I recognize," he said, "that there will be fewer of them than jets but their variety will be greater."



PHOTO at right shows a procession of flight students marching in the Nov. 7 parade in Red Square, Moscow.



Russians Display Ground Forces, Weapons

Russia exhibited several new types of ground equipment at the Nov. 7 parade in view, anniversary of the 40th anniversary of the Bolshevik revolution. These photos show some of Russia's ground force equipment, as displayed in Moscow's Red Square. Photographs of Soviet tanks and BTRs appeared in Aviation Week Nov. 15, p. 29. Ground-based weapons in the Russian parade include self-propelled 57 mm guns capable of being transported by heavy cargo helicopters, heavy tanks armed with 122 mm guns, fully tracked 240 mm rocket guns capable of a range of fire rates, a hovercraft 10 times faster than its predecessor and large mortars that may be able to fire atomic shells. Perhaps the most significant development is a 12-man-carrying helicopter, the Mi-6 (AW Nov. 15, p. 30).



SOVIET exhibits ground equipment shows defense improvement was expected even in World War II. Note tanks being transported on truck in left background.



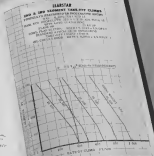
FLIGHT students at left are seen in photo at top right. Paratroopers are shown at right, they are armed with new automatic guns.





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TRANSPORT CATEGORY 4A

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RANGE 1 AND RANGE 2



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Outboard type of short stack exhaust to 8 cylinders showing flush oil pipe.

The new PacAero short stack system can be quickly installed by 2 mechanics in 4 or 6 days depending on the type of engine.

CONVERT 360 TO PACAERO FOR RAFFER (LAND) 10000 PROF CERTIFICATION—In particular, these aircraft are the efficiency and performance of the new Learstar engine and low engine installed.



PacAero's engine program (PAC-1000) as it is known, allows the Learstar to be converted to a 360 engine. This is another example of PacAero's complete sales and service operation.

Learstar owners and operators, as well as those interested in details of acquiring the Learstar, can contact PacAero for a complete information "kit" or "package" form which can be installed either at PacAero or by qualified fixed base operators elsewhere. This dual feature permits operators to select the steps needed and the time and place for installation.

In the Learstar 360 or 440, the Learstar has selected PacAero to perform all rights parts and modifications, and to obtain U.S. 440 engine (Learstar) licensing for both the modified and original.

JET AND ROCKET ENGINE TESTING EQUIPMENT BY PACAERO In addition to its widely used test and ground support equipment, PacAero has recently purchased several models of equipment for use with jet and rocket engines. This forward step is especially significant in view of the increasing activity in this power field.



Electrical and pneumatic engine shock-out systems used to give "dry run" of rocket engine's liquid fuel system.

GRUHAM DISPERSED NEW PACAERO DEVELOPMENT In conjunction with its production program, PacAero's development program will be active in the field of dispersed new aircraft, including the Learstar, and other high frequency aircraft.

The Learstar's complete sales and service operation, as well as those interested in details of acquiring the Learstar, can contact PacAero for a complete information "kit" or "package" form which can be installed either at PacAero or by qualified fixed base operators elsewhere. This dual feature permits operators to select the steps needed and the time and place for installation.

A conductor embedded in a medium will produce a wave given frequency when its length is approximately one-half the wavelength of the wave. When the medium is the length of the wave, the wave will be about one-half the length of the wave.

The antenna of the Learstar is described in a new component equipment is shown, which is shown in the ground station problem at low and very low frequencies.

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The antenna of the Learstar is described in a new component equipment is shown, which is shown in the ground station problem at low and very low frequencies.

are horizontal position and it makes the ceiling low. The combination of the low ceiling and the electron beam bombardment of the hollow cylindrical semiconductor changes the state of the semiconductor so that it conducts, emitting the ceiling low in its corresponding low frequency. V, R, S and IS. At the same time the current flowing in the upward position the dial tone for the ceiling telephone.

When the number is dialed, a voltage corresponding to the number is applied to the horizontal deflection plates, deflecting the beam to the horizontal position corresponding to the called number. The electron beam passes through the hollow semiconductor at the junction of the called and calling numbers, changing the state of the semiconductor and causing the called place to ring.

When the called party lifts his phone, he applies a short quarter of a volt across his line on the line feeds back and at the same time releases the electron beam. Because there is more than one volt across each semiconductor on the same bank, the current is maintained until one party hangs up.

According to Dr. Vinograd, the entire assembly could be incorporated in an evacuated envelope no larger than a two inch or possibly a one inch—envelope or tube envelope, although he believed that no attempt had been made to work out the detailed design.

Transmission Equipment

Dr. Vinograd said that he planned to represent a highly complex system, utilizing the low noise level of the superconductive Maser plus transmission, would be available before the year under consideration. Accordingly, he discussed antennas, transmission lines and transistors.

The extremely high antennas required at low and very low frequencies to achieve even moderate efficiencies have severely limited their use. The introduction of low noise receiver antenna has extended this problem even to high v.m. high and ultra high frequency ones. Even low antennas have left much to be desired.

The feasible antenna described in a new component equipment is shown, which is shown in the ground station problem at low and very low frequencies.

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North-Seeking Gyro

Portable instrument for guiding missile launchers, mobile radar or mobile guidance systems in two axis without external aids, now has been developed by North American's Avionics Division. Doctor, called ABLE (Automatic Beam Line Equipment), makes precision earth-seeking gyro, weighs 70 lb. It can be aligned to north by compassless processor in less than 90 sec. at 50 deg. latitude, less than one hour at 60-70 deg. latitude, NAA says.

Used in this manner, the thickness of the material would be selected to match the cone point appearance of the surface and the limits to five space. This type of antenna would be of practical use (about 100 ft.) and extremely efficient in comparison with the top-loaded antenna used today.

With the type of antenna it would be practical to build earth-direct in one which could be electronically steered. The ferrite-like material could provide the necessary device for doing this. The output of the transducer would be fed into a number of transmission lines, one for each radiator. In each transmission line the ferrite material would be used as a phase shifter, with the phase shift controlled by an electronic circuit, to focus a beam in the desired direction.

The technique could be applied to other types of physical areas and would be extremely broadband because of the easiness of phase shift for local length and magnetic field, independent of frequency.

Aluminum Antennas

For airborne antennas, the previous air-on-air provide for the first time, an antenna which not only has no drag but which actually provides thrust. As heated gas is a conductor of electric magnetic energy. To obtain the equivalent of a trailing wire antenna for high

Mach number aircraft, either outside or fuel exhaust gases would be ionized and carried forward in a stream.

The stream would form an ionized conducting column which would effectively couple the transducer to the space. Achieving the velocity of the sound gas stream would control the length of the conducting column to provide maximum radiated power.

Various ideas are the major problems in present day transducer because of their low efficiency and poor reliability. If the power arrived to heat the air stream and provide an ionized column, it included as part of the repair, the radiated output power would be at a very low percentage of the input power.

For this purpose, the 70 lb. vacuum semiconductor supplies provides an at-traction advantage. Even for 40 lb. total weight, the 4,100 semiconductor, at-traction would occupy less space than present equipment. Using radio power transmission for components, the total bulk required using semiconductor supplies would be about 3 cu ft.

The reliability of the transducer would be increased many times. The individual increase in reliability of the semiconductor over the vacuum tube is well known, in this case, however, the major increase in reliability results from the large number of components in parallel. The failure of a component or an amplifier does not reduce the output power by more than 0.02%.

If the stream generated could be the reader to diagnose, or if they stimulate his imagination, then, as Dr. Vargha's stated, his paper will have completely served its purpose. He said that communication in the rapidly changing air age is the major stumbling block in almost all operations. He predicted that our scientific needs are closely linked to think about future problems in engineering in performance will follow.



No Insulators Needed

New modeling process cuts dimensions on air stream which detects the which elements used in making electrical components from the chemical, not merely thermal path, for insulating heat from components to chassis. Delivers less insularity has resistance of several thousand megohms. Process was developed by Hughes Aircraft Co. and Avionics Corp., affiliate of Avionics, Inc., North Gate, Calif.



HONEST JOHN artillery rocket depends on G-E electric heating blanket (not) to bring nozzle to uniform operating temperature before launching.

HONEST JOHN FIRING SHOWS HOW . . .

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REAL BRASIL



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for Convair conversions

The Brazilian airline REAL Transportes Aereos do Brasil de Sao Paulo is to convert three of its fleet of piston-engined Convair airliners to Napier Eland turbo-props.

REAL states that it intends to convert its entire fleet of Convairs—another 17 aircraft—after assessing the results of the first conversions. With the substantial increase in power, range and speed, these converted Convairs will show a high financial return. Improved operating flexibility, lower maintenance costs, and long component life and reliability in all conditions are all attributes of the Eland made possible by its advanced and fundamentally simple design. Passenger appeal too will be high because of the smooth, quiet journeys which the propeller turbine brings to modern air travel. And the extra 2,000 h.p. available will enable the aircraft to carry its full payload when operating from high altitude airports and at the highest ambient temperatures.

This Napier conversion scheme can be introduced into certain other piston-engined airliners, besides the Convair, with no less impressive results in operating efficiency.

Napier Engines Inc., a subsidiary of D. Napier & Son Limited, with its headquarters in Washington D.C., has been recently formed to support the Eland conversion program in North and South America.

NAPIER ENGINES INC., Suite 901, Queens Circle Building, 1201, Connecticut Avenue, N.W., Washington D.C. 20004, Tel. (202) 462-1233, Cable: Napier/Washington

is beginning



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Ithaca, New York



PORTABLE superhigh frequency communications system uses dual mounted antennas.

Scatter Communications System Uses Portable Plastic Antennas

PL. Huchesa, Ark.-Comport, air-transportable troposphere scatter communications system, which employs lightweight 15 ft. diameter inflatable plastic antenna reflectors is being utilized here at Army's Electronic Proving Ground.

System, developed by Collins Radio, can be completely jacked in two small bays which can be carried in C-119 or C-124 transports, and which serve as shelter for the electronic equipment while system is installed. Scatter operates in the 1,600 mc. (11111) band and provides multi-channel, secure radio distance of 50 to 150 mi.

Antenna reflectors are constructed of plastic material clamped to a hoop and

sited to provide aeroglyc parabolic shaped surfaces when inflated. Inside surface of rear section is coated with aluminum to serve as reflector of radio waves emerging from feed horns mounted in front. Construction is simplified due to flexible nature antenna developed in Westinghouse Plastic (AW Dec. 22, 1956, p. 94).

Approximately 11 men are required to inflate the fully propagated antenna reflector, usually by means of a motor driven blower. Reflectors are painted a continuous fluorescent for ease of cutting of the blower.

Inflated antenna is designed to withstand winds of 70 mph. Collins unit, and has withstand 50 mph winds at the test site. Complete antenna, including tower, weighs about 400 lb. weighed in 1958 by test on open flat terrain of mountainous country. Antenna is quickly erected, Collins unit, and adjustments make it possible to shift reflector bearing point over a range of ± 3 deg. in elevation and ± 5 deg. in azimuth.

Feed horns is open ended waveguide type, providing VSWR less than 1.11 over the 75-950 mc range which characterizes need for an antenna tower. Reflectors less 6 ft. feed length and feed provides a 10 db. characteristic taper with approximately 20 db. gain relative to an isotropic antenna, Collins reports.

Two test facilities with remote, approximately 7 x 7 x 84 ft. One houses engine, receiver and transmitter and the other contains a 1 kw. power amplifier, driver and power supply. System employs two antennas, each tapered to provide space diversity operation.



Air-transportable troposphere scatter communications antenna is quickly erected.

Louis S. Rothschild Among AMB Speakers

Philadelphia-I nstitute has announced range speakers at its upcoming symposium on "The American Modernization Board, Its Mission and Methods," to be held Dec. 16-18 at Sheraton Hotel in Philadelphia. Principal speakers and their subjects include:

- Elwood R. Quasha, AMB chairman, The American Modernization Board, Its Role in U.S. Antitrust-Present and Future
- James L. Auer, AMB acting technical director, The American Modernization Board Program
- Louis S. Rothschild, Under Secretary of Commerce for Transportation
- Milton W. Aschaff, vice president of operations and engineering, Air Transport Assn.; Joseph T. Goring, Jr., American Facilities Planning Group; and C. Thomas Burnett, executive director, Airport Operation Council, The American Modernization Board, Co-located Editor
- R. S. Barshley, W. W. Feltus and J. S. Cavallaro, Philadelphia Institute "A Systems Approach to the Air Traffic Control Problem"
- Benjamin F. Gans, AMB technical staff, Some Technical Aspects of the AMB Program
- Richard H. Jordan, AMB director for operations analysis "The Place of Op-



Missile Tracker

Electronic antenna, with 60 ft. reflector, is one of five now addition to Air Force missile range extending 1,000 mi. from Cape Canaveral, Fla., into the South Atlantic. The 50 ton telemetry antenna, designed and produced by D. S. Krimm & Co., is being installed at Canaveral and Midfield, Fla., the American Launch, Antenna, Rebirth West, Antenna, and Rebirth, New York. Antenna will be used to track U.S. earth satellites.

MICRO-BEARING ABSTRACTS

by A. N. DOWNS, President
New Hampshire Ball Bearings, Inc.

MEASUREMENT OF RADIAL RUNOUT

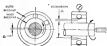


Fig. 1—Measuring eccentricity of disc with respect to inner runout.



Fig. 2—Inner runout is out-of-round, although concentric with bore.

Definitively questions are raised by the method of measuring "in-out-of-round" and "out-of-round" property, a discussion of "eccentricity" and "out-of-roundness" is presented.

The amount of out-of-round, or lack of roundness of a given part (outer or inner ring or ball) is the difference between the maximum and the minimum diameter of the part in question. Eccentricity refers to the distance between the centers of two circles. Eccentricity refers to the exact coincidence of the centers of two or more circles. In high grade instrument bearings there is a very small difference in the maximum eccentricity between the bore and the inner ring runout, and likewise between the outside diameter and the outer ring runout.

Inner runout out-of-round is measured by forcing the ring between the rounded ends of two disks, one of which is fixed and the other of which is mounted on the rotating mechanism. The difference between the maximum and minimum readings gives the amount of out-of-round. Out-of-round of the outer ring runout is measured by placing the ring over two rounded blocks which support the runout. One part is fixed and the other rotates on a rotating mechanism.

As the ring is rotated, the difference between the maximum and minimum readings indicates the degree of out-of-round.

The true amount of eccentricity between the bore and the inner ring runout may not be measured, providing these parts are not out-of-round, by measuring the eccentricity between an exactly tapered arbor, applying a cylindrical indicator on the center of the stationary outer ring, and then directly rotating the arbor. The eccentricity in the difference between the maximum and minimum given reading as the arbor is

rotated through one revolution. Similarly, the eccentricity of the outer ring is measured by the difference in the dial readings with the arbor and inner ring held stationary while the outer ring is rotated one revolution. Fig. 1 shows the set-up with an inner runout which is concentric with respect to the bore.

In the case shown it has been stipulated that the bore and inner runout must not be out-of-round, for only under these conditions is the true eccentricity indicated.

If the inner runout is out-of-round, while being either concentric or concentric with respect to the bore, the out-of-round is transmitted to the runout, thereby unbalancing the readings. A condition in which the inner runout is out-of-round although concentric to the bore is shown in Fig. 2.

In view of the fact that the majority of bearing rings will unavoidably be somewhat out-of-round and eccentric, however slightly, it is obvious that the measurement described above indicates neither true concentric nor true out-of-round but a somewhat of the best available figure, an indication as to how correctly turned radial round.

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NEW HAMPSHIRE BALL BEARINGS, INC., PETERBOROUGH 1, NEW HAMPSHIRE

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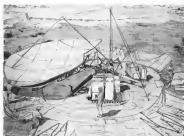
James N. Deas, AMB consultant. "The AMB M&E Operate." Registrations for the \$70 will be charged to cover cost of brochures, bench and tops of companion process unit.

Registrations should be sent to Capt. R. S. Barabak, Chief, Aeronautics Section, Ames Research Laboratories, for Research & Development 2000 A, Palmdale, Philadelphia 5, Pa.

Expansions, Changes In Avionics Industry

Passenger airline companies active in New York City will be opened in 1968 by Mid-Country Testronics Corp. of New York. The \$218,000 Manhattan Computer Center will operate 24 hours a day, seven days a week.

The rates for charter subscriptions have been set at \$38.90 per hour for



Portable Early Warning Radar

Tested early warning (TEW) early warning being developed by Sperry Gyroscope Co. for Marine Corps, is highly mobile, highly portable and provides near-instantaneous data (bearing, height and range) at extremely long ranges. New AN/MPN 21 is about two-thirds the size and weight of conventional radar systems according to Sperry engineers and allows a V-shaped comparison to determine target height. Complete installation, including an antenna and wall volume, typically can be set up in two hours.



Test Engineering at Marquardt



by
Roy E. Marquardt
President

Design among air-breathing engines, the engine cannot run independently on the ground. Because ranges depend on their velocity through surrounding air masses for compression of combustion air, intricate test facilities must be provided.

Marquardt Int. Laboratory simulates these high-speed, high-altitude flight conditions during ground testing. A USAF facility, combined with special USN test facilities, MIL is one of the most extensive in existence today. Valued at \$18 million and occupying 6 acres of land, this dynamically functional engineering tool minimizes the number of costly trial and error flights of new engines.

Complex test cells, with simulated instrumentation and computer, permit sea-level and altitude testing of full size and test-scale models. In our two sea-level test cells, high pressure air is directed over the test engine through subsonic, sonic, and supersonic nozzles, and exhausted to the atmosphere. Turbines are ingeniously situated in two full scale engine altitude test chambers to duplicate heated and shocked air conditions encountered by high-flying supersonic jets.

Special configurations in both sea-level and altitude cells permit angular motion of the free jet nozzles. This allows evaluation of the effects of varying angles of attack likely to be encountered by operational engines.

A new production acceptance test facility now being built in conjunction with our Ordon production plant will greatly supplement the up-to-the-minute equipment furnished the Marquardt Test Team.

Within this Division, engineering openings exist for:

Mechanical Engineers Aeronautical Engineers Electrical Engineers Construction Engineers

For information about these positions and the professional engineering requirements at Marquardt, we invite you to write Jim Dale, Personnel Personnel, today.

Roy E. Marquardt

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VAN NUYS, CALIFORNIA DORR STAN

Picture above: Leigh Deas, Chief Engineer, Test Sub-Division

* ENGINEER | BARRIER — an achievement level beyond which you cannot advance

use of 45 amplifiers, company vice president will have total of 175 amplifiers available.

Other recently announced expansion and changes in the antenna industry include:

• **The Barden Corp.**, Danbury, Conn., manufacturer of precision bell bearings, has opened new sales and engineering offices in Los Angeles. The 15,000 sq ft facility, headed by Robert Blum, is located at 3850 Wilshire Blvd. Barden also is constructing \$1 million, 125,000 sq. ft. manufacturing facility in Danbury, slated for June completion.

• **Sprague Electric**, North Andover, Mass., will build 21,000 sq. ft. manufacturing facility at Visalia, Calif., to house operations now located at head quarters of Sprague's Pacific Division in Visalia, Calif. Moves will place operations about midway between Los Angeles and San Francisco where needs in late spring of 1985.

• **Consolidated Controls Corp.**, subsidiary of Consolidated Diesel Electric Corp., will acquire business and plant assets of Messing, Merrill & Moore's Aircraft Products Division, which develops and produces aircraft

Radiation Effects

Battelle Memorial Institute has set up a Radiation Effects Information Center, under *An F-16* sponsorship, to gather and disseminate data concerning effects of nuclear radiation on materials and systems used in aircraft. Information could include, but not be limited to, assessment of available data, providing it to contractors and agencies doing work under the Air Force in the form of reports, seminars and monthly listings of data received.

New information center, headed by Battelle's C. E. Volchok, was established to support the Air Force's nuclear-powered aircraft program but will also provide service to Army, Navy, Atomic Energy Commission and other government agencies. Center also will assist Air Force in defining areas in which radiation effects research should be initiated or expanded. Battelle Memorial Institute is located at 591 King Ave., Columbus 16, Ohio.

special controls, effective Dec. 31, 1977. Joseph P. Ringberger, general manager of the Aircraft Products Division, became president of Consolidated Controls Corp., and chief engineer H. W. Ketchum became vice president and chief engineer.

• **Colco Electronics Inc.**, San Diego, has formed new Research Division with headquarters in San Diego and laboratories in Van Nuys at 17431 La Jolla New Division is headed by Dr. Maria L. Klein.

• **CBS Laboratories** has broken ground for new \$1 million 37,000 sq. ft. facility in Shrewsbury, Conn., slated for next spring next summer. Approximately 150 scientists and administrators personnel will be employed at new facilities.

• **Consolidated Electric Co.** has opened new 750,000 sq. ft. West Coast regional manufacturing facility in Santa Ana, Calif. The \$11 million plant is expected to employ 1,500 persons within three years.

• **P. R. Malley & Co.**, Redwood City, has acquired plant and equipment in an enterprise named as *Malley's Aircraft Corp.*, Santa Monica, Calif. New acquisition, which produces inspection facilities and actuating devices, will operate on the same site as a Malley subsidiary.

• **Applied Science Corp.** of Princeton (ASACOP) has acquired the former South Division which will be known as the Electro-Mechanical Division, it being scope of its activities.

• **Jackson Electronics & Manufacturing Co.** has moved to new quarters at 685 Johnston St., Akron, Ohio.

EQUIPMENT

Instant Response Claimed for Climb Unit

By Russell Huxley

Los Angeles-based Vertical Velocity Indicator (IVI) developed by Sensory Concepts Co. has promise to money pilots' need for an instantaneous rate-of-climb instrument. Conventional instrument, based on a leaky altimeter, "was never really safe before because it could lag by 10 seconds."

Many pilots feared to compare the rate quickly with an altimeter and a clock. The conventional instrument is becoming even less useful with the advent of high performance planes with such high rates of climb and descent that the instrument may not catch up until the airplane has already arrived at its new altitude. At 80,000 ft., the standard instrument may lag by well over a minute.

High response, barometric vertical speed indicator can do this, but, say Sensory engineers, they will still suffer from the disadvantages of pilot-static sources or, if dynamically corrected, will be subject to measurement system transients.

Response rate of Vertical Velocity Indicator proved to be two feet per second and indicate lag was actually increased from 25 inches at 65 miles per hour to 100 inches at 150 miles per hour and small scale rate before.

Unaffected Proposal

Vertical Velocity Indicator grew out of an unsolicited proposal of Navy. Itaker which resulted in a development contract for \$94,457.33. Sensory then set up a private investment corporation, \$100,000. One private investment has been obligated to the Navy and a second is about to be deflected. Wright Air Development Center has expressed interest in doing an independent USAF evaluation. When results are in, the service may get together and discuss purchasing and specifications for this type instrument. Prototype have lagged about 150 ft. for five hours to date. They reach 45 ft. per second, while production version are expected to reach up to the neighbor hood of 20 ft. Even this might mean some conservative but for the fact that the unit has more components in common with other instruments which would naturally be shared to avoid duplication of weight, volume and function. Redundancy of not weight, including growth



LARGEST (IVI) has custom vertical gyro, measurement pickup, manual altimeter. Small box has a semiconductor amplifier. IVI has supply signals, both with its indicator.

factor, added to the airplane by installed IVI runs from three to 30 ft.

Original Baker specifications, written at the time the development contract was set, required that the instrument work between altitudes of 50,000 ft. and 1,000 ft. below sea level and infer rate vertical speeds of 60,000 ft./min without change. This last requirement is not interpreted to mean that the instrument must achieve such high vertical velocities. Larger vertical speed

indication on the face of the prototype instrument is 5,000 ft./min.

Vertical Velocity Indicator, in its more rudimentary, is an inertial instrument which integrates acceleration once to produce the desired rate measurement and integrates only to produce altitude for comparison with an external altimeter.

The differential of current and horizontal height is put into a feedback loop to cancel the inevitable integration error which would otherwise continue to grow with time.

Credit Moratorium

Executive of Vertical Velocity Indicator is an advanced stage of development now has an important bearing on the outcome of Sensory's current investment. The purpose now is to get products and contracts to get cash. A 90-day moratorium placed on further late month breaks, the code by providing cash for that period.

A number of large corporations, all of which is expected to be Adu Co., are seeking to merge with Sensory to take over the company's line and a number of promising investments in other Vertical Velocity Indicator units.

This instrument and a Navy loan device refers to the better development than in the shop but in the actual course of events it would take conflict just for a production contract to get off over a development.

Inertial Pickup

The heart of the instrument is an inertial pickup held in a vertical orientation by a three-axis redundant gyro. Inertial pickup is mounted in the vertical axis, the pickup. The gyro will measure current during acceleration and need not be rigid. Data gained is used down to maintain the angle between the inner and middle gyros with 60 deg. of the right angle, the knowledge regardless of whatever forces the airplane rotates at a velocity, greater than one revolution per second.

Because of this tolerance are not known. Maximum current is the system is 400 cycles. Undoubtedly, natural frequency of five inertial pickup used may also 600 cycles. This has been reduced to 250 cycles to eliminate resonance.

Core of the design problem is the Vertical Velocity Indicator must be used for fast response, cross-free rate

NOTABLE ACHIEVEMENTS IN WIND TUNNEL TESTING... 2

CWT engineers are a dedicated group, spending many extra-curricular hours in the pursuit of basic scientific information. The result of a recent test is shown below.



What's In The Wind At The CWT...

Since 1945, the CWT's primary interest has been the developmental testing of high speed aircraft and missiles. From the *Huac* to the *Nite*, from the *B-2* to the *Starfighter*, the CWT has helped develop some of the most important series in aviation.

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DV magnetic system finds submarines below the surface

The use of Magnetism has greatly increased the accuracy of submarine detection. Magnetic devices supplied by Dalmo Victor to the Navy now equip the Lockheed P3V-7... help it locate submarines even when submerged. The versatile bomber's geotailing, wing like tail houses the complete Magnetic System that projects magnetic fields for a quick kill in all weather.

Currently Dalmo Victor is developing one and more advanced Magnetic Systems for submarine detection. These systems utilize a combination of DV's skills in electromechanics, hydraulics, servo mechanisms, electronics and magnetism.

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gration of acceleration. Nullification of vibration error by feedback of position attitude offered a second theoretical approach but progress was slowed for a while by lack of a fast accurate integrator and a sensitive record pickup.

Integrating Motor Design

Somerset engineers have designed and built dual wound d.c. integrating motors with inertia of only 5-10⁻⁶ gram-cm² second. Their best motor converts electrical to mechanical energy with an efficiency of 90-95% at the light loads in this application. Torque sensitivity is 687 cm-sec/ohm-amp. The motor is fabricated by winding the resistance of 40 to 46 gage wire upon a core made by crimping the field magnet in aluminum and machining to size. After the structure has been wound into the core it is impregnated with a clear thermosetting plastic and the aluminum core case is chemically etched from between the magnet and the structure. The ring cut is then cut through from the outside shell and a base plate and shaft are



Relative Danger Light

Latest invention of Atlas relative danger light, designed to prevent and reduce collisions, (AVN-CR-2, 1948, p. 73) was made recently on North Coast Airfield DC-3. One unit was installed inside each wing tip. Each unit contains two white, photostatic, capacitor-discharge-type lamps which emit a brilliant, very short duration flash at different intervals. Flooded lamp flashes 160 times a second, two on the side 90 times a minute and the rear light 40 times a minute. This allows the pilot of another plane to determine whether the relative danger light conveyed accurately is approaching him, is on an approximately parallel course, is on a long away from him. North Coast says the lights are readily visible at 30-40 mi. Units were installed as part of a fleet modernization program to make it more easily visible under operating conditions. Lights were developed by Capt. H. Wilson Adams, a Northwest Coast Airfield pilot.

attached to one end of the antenna. The loss of unpowered antenna energy from 977 to 1045 m, depending on wire gage used. This is usually no loss due to its and torque in the field magnet is almost completely enclosed by the structure. Zero power impedance was lag in 5 milliohms between winding sets as a high generator producing a voltage used to control motor current drive which is a direct measure of one winding eye.

Amplifier for the base signal located ahead of each antenna also serve as added to get in sensitive feedback from the pressure detector.

Smooth Operation Required

Pressure altimeter accuracy is not critical in certain operations. As much of a standard test could probably be completed without causing trouble. Only real measurement for the overall instrument is smooth operation with maximum precision, but not. If smooth follows were there with some other instrument accuracy, even accuracy, it would be obtained without much difficulty.

Chief problem associated with the pressure altimeter is picking off and representing several positions. Output end of bellows comes only about one inch for the full 10,000 ft. operating range of the altimeter. Potentiometer pickup leads to work out because output required magnification factor is high at 10,000 which calls for high error free question that must be satisfied for use in servo loop. A high response photo cell device putting out 10 VDC per volt of sensor level, available has designed. This translated weight of the altimeter and provides and some problem associated with high magnification has since come in necessary. In fact, output is slightly attenuated.

Photo cell and light source are mounted through an air at 15 deg for 50,000 ft variation of altitude by the output from the second integrator. A mask between the two is rotated at the same rate by the control signal. Light reaching the receptor element is controlled by the relative position of light source photo cell and mask.

Photo Cell Movement

Developing gear appears as relative movement and displacement generates a proportional d.c. error signal which reaches the customer through when once reaches 400 ft.

Accuracy of measurements is within a few thousandths of a percent at vertical speeds up to 5,000 ft./min, the maximum vertical speed which the indicator will accept. The working part of the instrument will follow vertical speeds up to as high as 50,000 ft./min in accordance to the Reber specifications but with reduced accuracy.



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Shrinkage	Over 200° to 10° @ 200°C to 100 ft.
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AMF's new mobile liquid oxygen plant, produced by Air Products Inc., Allentown, Pa., can produce liquid oxygen within few hours after arrival at launching station.

Liquid Oxygen Plant Is Mobile

Mobile liquid oxygen factory mounted on four semi-trailers recently was delivered to U. S. Army Corps of Engineers by Air Products Inc. Factory, which cost \$1 million, will act as a bottleneck liquid oxygen plant to supply the large quantities of oxidant needed by Army missiles such as Redstone and Jupiter C.

Plant Output

The plant is designed to produce 20 tons—about 50 barrels—of 99.5% pure liquid oxygen per 24 hr. day from emission air when operated at normal atmospheric pressure and at 525° Fahrenheit.

Total weight of the four trailers is approximately 200,000 lb. Each is 8 ft wide, 11 ft high and 30 ft long. Trailers will operate on standard tire pressures ranging from 175 to 215 lb. per sq. in. of steel tire per hour and yields about two pounds of liquid oxygen per pound of fuel consumed.

Two of the trailers are skidded. Each carries a 1,200 hp. opposed-piston diesel engine (same as the light weight Navy submarine engines) which drive two-stage rotary compressors to compress air to 100 lb. per sq. in. The gasolines to supply the plant's electrical power. All of this equipment is supplied by Turbomeca-Mare.

Heat Exchangers

Trailers also incorporate extended surface heat exchangers for cooling both the diesel and the compressor and to provide preheating cooling for the compressed air as it leaves the unit.

Compressed air is fed into a heat exchanger mounted on a third trailer. Here it is further cooled and water vapor, carbon dioxide and other impurities are frozen out. When it

emerges from the unit, so is very near the liquid state.

Air then passes to the fourth trailer where it is transformed into liquid oxygen.

This trailer also houses a control panel where instruments show the condition of all major machinery in the various trailers.

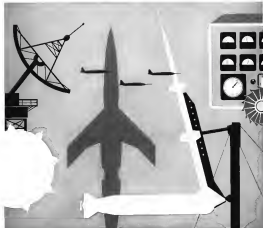
Special low-temperature nylon had the liquid oxygen so it comes from the plant to the launch or to storage area. Each week trailer is capable of holding 4 tons of liquid oxygen and of storing it hundreds of miles.

Heated Tent Speeds Plastic Mold Curing

Dallas-Houston tent developed by Chance Vought Aircraft, Inc. for curing plastic molds installed around F8U-1 wing having electrical connections has not come more than 30 to 40 ft.

Tent is made of aluminum canvas and is 41 ft. long, 7 ft. wide and 5 ft. high. A framework of 2-in. pipes keeps the structure in shape and supports an electric heater of two or four aluminum pipes in blue air heated to 190° into the tent. Monitoring tent feeds into driving.

Electrical wiring harness for F8U-1 Crusaders are assembled on 40 ft. wire racks. Plastic parts are cured. Windol, is placed on the construction. Then crushed bolts place the tent over the assemblies for curing. Tent was developed by manufacturing research engineers E. V. Black and P. M. Partridge. Before their device, was developed, molds had to stand 24 to 36 hr. while the potting compound cured at room temperature.



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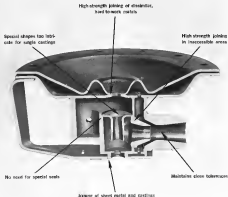
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Fast Process Unit Developed for Film

New York—Scientific, self-loading, portable film processor which can develop, dry and have ready for projection 100 ft. of black-and-white 16 mm. movie film in 20 min. has been put on the market by Fairchild Camera and Instrument Corp. Called "Mini-Rapid 16," the machine requires only a 110 v. a.c. outlet to process film.

It can perform its entire function in total daylight, from loading to turning out finished film.

At a recent New York demonstration, the machine proved it could develop commercial quality film in a matter of minutes. New permanent records can be obtained by running the film through the machine a second time for a more thorough wash. An accessory kit is available for attaching the machine to a sewer pipe, thereby permitting a constant-flow washing operation.

Machine is the first of a family of developing devices to be produced as their stress by Fairchild. Next units will be designed to handle, respectively, 35 mm. film 75 mm. film and photographic paper.

Among types of photographic material from which might be expected to benefit from the machine are records of microscopes, gas camera films, aerial film records and high speed x-ray photoemission data.

Mini-Rapid 16 accepts a roll of 16 mm. film in a compartment at the left of the machine. Film is reeled clockwise into a developing tank and compartment is closed.

Film is automatically threaded through the processor to take up spool on top of the machine, a trip of approximately 2 ft.

Film is passed through four 18 in. tanks containing, respectively, high-speed developer, rapid fixer, hypo-bleaching agent and water. Time taken in film does by a high velocity jet blowing on the emulsion side. Film emerges from drying compartment.



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about and winds automatically on take-up spool.

Machine can accommodate film length ranging from 1 ft to 400 ft. As first few feet of developed film come out of the machine they can be checked for correct developing time. If over-developed, machine can be slowed to increase developing time.

Triplepurpose rubber rollers over which film passes from tank to tank drive the film, agitate the various rollers and transport film from the film tank into each tank to reduce overexposure from one tank to another. All chemical tanks are removable for cleaning and refilling easier.

Mini Rapid 16 is made of stainless steel and weighs 55 lb. dry. It stands 27 in. long, 17 in. wide and 13 in. high. Price is \$1,210.

OFF THE LINE

New, light weight, pulse type trochoidal turret pump has been put on the market by Sundstrand-Denver. Used, designed to pump such liquid gases as nitrogen and liquid oxygen, has demonstrated its ability to pump liquid nitrogen pressures exceeding 3,000 psi and speeds over 3,500 rpm for over one hour with any type of



lubrication. Most recent change would make the pump compatible with liquid oxygen.

Pump, which is a modification of a standard Sundstrand hydraulic motor, has flat performance data: displacement — 0.116 cu. in./rev., capacity at 3,000 psi — 99%, weight — 2.5 lb.

Other, large capacity cryogenic pumps are currently under development. Address: Sundstrand-Denver, 2400 West 76th Ave., Denver 11, Colo.

Reflex inertial angle rest, Minicall T-74, has been designed to meet high-



scale twist up travel. Portion of the rest extends, fold up and can act to help passengers dismount each other, adjustable legs, individual seat trans-

ferred into the back of each seat and provision for plug-in-type seat travel. rest's total weight is 75 lb. in sliding rail track, safety belts and other accessories.

New, closed-loop flow test system for chemical and gaseous test equipment using 90% hydrogen peroxide as hot medium has been opened by Avionics Laboratories. Operating range is up to 150 gpm of 75 psi. Flow tests over a wide range of environmental conditions are possible. System is available to equipment makers for evaluation of solid and liquid components. Address: College Point, L. I., N. Y.

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In case of enemy attack, atomic-powered submarines armed with Polaris missiles could strike a devastating retaliatory blow from anywhere in the vast expanse of ocean that cover nearly $\frac{3}{4}$ th of the earth's surface.

The launching site for this atomic missile will be mobile and hard to find. It will be a submerged atomic-powered submarine capable of operating underwater around the world and hidden anywhere in the ocean's depths. With this mobility the Navy is able to operate close to any shore ready for instant retaliation.

Typical of the problems being solved in perfecting the Polaris missile are intricate guidance and fire control systems being developed by the U. S. Navy, the Massachusetts Institute of Technology, and the General Electric Company.

With Polaris, the Navy adds ballistic sea-power from the hidden depths of the ocean to its traditional advantages of speed, mobility and long range in helping defend America. *Missile and Ordnance Systems Department, General Electric Company, Pittsfield, Massachusetts.*

10-11

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FROM A HIDDEN SITE, deep in the ocean, 1500 mile Polaris missile can be shot to the surface and barreled through space at tremendous speeds. Hard to detect, mobile launching sites make defense against Polaris practically impossible.



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WHAT'S NEW

Reports Available:

The following reports were sponsored by The Office of Technical Services, United States Department of Commerce, Washington 25, D.C.

Research on the Influence of Ultrasonic Waves on Metallic Corrosion by S. Ragnan and T. Soga, Banca Institute di Ricerche Scientifiche Applicata, Milan, Italy for European Office, Air Research and Development Command, U.S. Air Force, Nov. 1959. 53 pp., \$3pp., (PB 121954)

The Corrosive Effects of Potent-Type Four-Forming Concentrations on Chemical Metals and Dissolved Metals by H. B. Peterson and J. C. Barrett, Naval Research Laboratory, June 1957. 53 pp., 21 pp., (PB 110111)

Corrosion of Metals in Tropical Environments Part I—Test Methods and Results obtained for Pure Metals and a Structural Steel by A. L. Akers and others, Naval Research Laboratory, June 1957. 53 pp., 40 pp., (PB 121952)

The Corrosion Products of Iron and Steel: A Selected Bibliographic Survey with Abstracts by M. J. Boffa, Naval Research Laboratory, June 1955. 57 pp., 24 pp., (PB 121953)

Electrostatic Materials Screen with Particular Interest to their Possible Use at High Temperatures by G. F. Feltus, C-3000, University of Arizona for Wright Air Development Center, U.S. Air Force, Dec. 1956. 53 pp., 11 pp., (PB 121949)

Nano-Cell: Ferroelectric Materials Part VII—Microscopic Examination by H. C. Roberts and U. B. Niles, General Electric Co. for Wright Air Development Center, U.S. Air Force, Dec. 1956. 53 pp., 4 pp., (PB 121955)

An Expanded-Component Method of Air Cooling by B. S. MacDonald, General Atomics Laboratories, Inc. Dec. 1954. 57 pp., 21 pp., (PB 121928)

Research on the Flammability Characteristics of Aerosol Hydraulic Fluids by M. C. Zabetakis, A. L. Farnes and J. J. Miller, Jr., U.S. Department of the Interior, Bureau of Mines for Wright Air Development Center, U.S. Air Force, Mar. 1957. 53 pp., 24 pp., (PB 121193)

Injection and Coagulation of Liquid Fuels by A. A. Peterson and others.



Tercruiser Delivery

The T-47 has right-wheel drive Tercruisers which have TMTS Motors guided, similar (14W) and 18 and supporting equipment over cargo trailer on pilotless truck in cargo unit from a Lockheed C-130 Hercules transport upon delivery to Pensacola AFB, Orlando, Fla. for use by the 490th Tactical Missile Wing. Vehicle is built by Four Wheel Drive Auto Co., Cincinnati, Ohio.

Battle Manual Institute for Wright Air Development Center, U.S. Air Force, Mar. 1957. 59 pp., 76 pp., (PB 121068)

Spark Ignition of Fresh Mixtures—Development of Apparatus and Preliminary Results by A. E. Wolff, Wright Air Development Center, U.S. Air Force, Dec. 1956. 53 pp., 31 pp., (PB 121951)

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That's half a century ago, sometimes we little know that a shrewdness, today it is a constant part of life. Bulletin to Jettis is the exciting story of the intense growth of our nation's field.

Handbook of Noise Control—edited by Carl M. Harris—Pub. McGraw-Hill Book Company, Inc., 120 West 42nd Street, New York 36, New York. 516 pp., 40 pp.

A comprehensive handbook, which discusses in detail the science of noise, its measurement, and techniques of its control in buildings, industry, transportation, and the community.

By Bearings and Human Values by Theodore V. Hunter—Pub. McGraw-Hill Book Company, Inc., 120 West 42nd Street, New York 36, New York. 55 pp., 18 pp.

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LATEST ADDITION to Bank line a low-alloy David Bull debenture at 140.00. Company expects to sell 20 million worth in 1993.

Beech Reveals 1958 Line, Big Backlog

By Erwin J. Redman

Boeing Aircraft Corp. now has a firm backlog of more than 5,000 commitments of 1968 model business aircraft orders, company president Neil G. A. Beach, revealed after a recent annual sales meeting. The meeting was held for 175 distributors and dealer personnel from the United States and 20 foreign countries at Wallula, Wash.

For its first two years, Pan Am's revenues were heavily dependent on passenger traffic. Although declined to produce a 1937 financial statement, the airline's total 1938 revenues, measured in dollars, showed a 10% increase over 1937. (The airline for Fiscal 1937—probably because we used the current month's base—was domestic.) Industries are dead if they have high hopes that introduction of a new model is the key—the light blue Pan American Travel Air will also be a major role in raising its Fiscal 1939 revenues. Several other airlines to continue to use a kind of post-war Pan Am Travel Air. Boeing was president of the airline, chairman of the Travel Air board, and in Fiscal 1938 a total new 37 will be

Holbeck also noted that the company has a combined commercial and multi-unit backlog topping 5100 million, an increase of 100 million over the same period last year.

newly introduced to product inspection records in the company's 1958 business aircraft line, which includes:

- **Triumph TR6**, priced at \$49,500, is the standard version.
 - **Bonanza J95**, priced at \$28,500.
 - **Triumph-Bonanza J95** (overcharged 1.6-liter engine), starting at \$38,000 and the Triumph-Bonanza TR6A (high-compression 1.6-liter engine) which starts at \$37,000.
 - **Elfin Super 18**, which is priced at \$17,995.
- Other surprises to escape your imagination are the **Triumph Spitfire**, which has been introduced the year-2000, the **Triumph Bonanza** models. Bonanza which has a new more powerful engine, is at approximately \$45,000. Super 18 has raised \$11,000.

Trend: An Absent

Designed to fill the big price gap between the Bonanza and T38s, the T3800 and also to meet competition from Piper and Cessna light twins, the new Travel Air features considerable use of composites from existing Bonza airplanes, including the Air Force and Navy T-34 Mentor trainer. A design factor that resulted in a short development time to production is the

Finally, the scaling is a 100-mph

crane hook with nonstop range ruzzing 1,400 psi on 182 gal of fuel. Airplane has been designed to utilize load factors and tested to an ultimate load factor of 5. Structure is strong enough to take a 45 ft/sec gust, the company reports.

Wings are composite assembly of Bonavia HT5, Twin-Bonavia and T-44 assemblies modified to accommodate needle and fuel tank components. Fueling is basically an HT5 structure, except for an extra rear nose section formed on the Bonavia (faired). Tail is basically a modified T-44 section, with a number of nose points and virtually unchanged landing gear components modified T-44 units.

Time: 45 min available with several different radio-communication equipment packages. Package No. 1 includes roughly 185 lbs. installed and costs \$12,475; provides Aircraft Radio Com. 113A transmitter, ARC 15E meter, ARC type 23A ADF, ARC T-20 20 channel transmitter and F-23 10 channel transceiver, ARC R-12 receiver. Wilson 2000 glide slope and three light marker beacon receiver. Package No. 2 weighs mg. 51 lbs. and costs \$6925, includes the ARC T-20, ARC 15E meter, ARC 20A marker beacon receiver, marker

Radio Package No. 3 weighs 24 lb. installed and costs \$1,195. It includes a Nano VTR 3B Oscillator. Package No. 4 has a Low LARA 676 VHF oscillator and costs \$1,275.

Also available for factory installation in conjunction with the above equipment is the Laser ADF-11E with Package No. 5 or 6 at an installed weight of 25 lb and cost of \$1,125. ADF-11E ADF with Package No. 2 or with 3 of Narco VG-2B Synthesizer is not installed, at weight of 24 lb and cost of \$1,375. Narco VG-2B available only with Package No. 5 and the Laser One system. Available only with Package No. 5. Laser units weigh 14 lb and are accurately calibrated to 5100 Hz. Cost/entry is \$1,000. Also get analysis, write fact book—ten 52-gram units replacing ten 77-gram tanks at eight percent or eight percent and cost of \$725.

1958 *Reproduction*

Biggest feature of the 1998 Bownor is the switch to a diesel fuel injection system, an all-new 2000cc Continental ID470 G engine providing 10 additional horsepower.

It can be expected that the closure of the reactor—and the problem of being in this central area—will be followed in other business aircraft. General, for example, has been flight testing such a fuel system for some time in its light twin, 100.

In addition to using positive compression, such a system also offers improved fuel distribution for smoother engine operation, lower reduction ratios, lower pumping losses, higher power output and more torque.

Additional power and the new fact system will put these important marketing points in the hands of Beech distributors and dealers.

- **High speed of 240 mph** at low level compared to 206 mph for last year's H15. Maximum cruise speed at 75% power is now 206 mph at 7,000 ft, compared to the earlier models' 191 mph. Cruise speed for the J15 is 195 mph at 65% power at 30,000 ft. Instead of 190 mph, at 8,000 ft on the J15.
- **Scorer rating for the J15** is 21,500 ft., compared to approximately 19,000 ft. for the H15.
- **Useful load of the J15** has been increased by 10% to 1,060 lb. compared to the H15. Although increasing the gross weight of 2,900 lb. 30 in. of lift has been made available without the passenger's baggage is 850 lb., 20% higher than on the H15.

In design, the J75 is not unlike the previous H35. The elevator control system has been changed by moving the forward baggage spring and increasing aft baggage spring tension. Baggage rollers now act as an elevator



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FACILITIES FOR PROGRESS—The Andrew Wilgus Turbine Laboratory at East Hartford is the most advanced privately owned laboratory of its kind in the world. In this almost continuously expanding facility, engines for tomorrow's major aircraft are operated under the most exacting conditions of altitude and speed encountered in flight. It is here that the engines are made to meet their performance guarantees before they are put into production and delivered to the wing customer.

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FLORIDA OPERATIONS—West Palm Beach

speed has been raised to comply with the 110 mph

Differences in operational requirements are a propeller feathering system, consisting of an actuator and which is changed when propeller control levers are in low pitch or takeoff position. As propeller levers are brought back to cruise position, a valve closes trapping oil under pressure in the accelerometer. After a propeller is feathered it can be brought back to pitch returning the levers to low pitch releasing the pressure in the accelerometer.

The Empire model has been changed from CSD-150 A1A6 to CSD-150 B1B6, the change covering an adjacent fee.

tion, which coats the pattern in sperm oil on the underside to reduce possibility of detachment and pattern burning. DDA, Versabond™ (epoxy, model) is changed from a GC488-C206 to a GC488-C1176, incorporating the same clarity.

Considerable amount of radio equipment is optional on the Tera Bottom. That for the F90 costs \$1,195 and has a installed weight of 67 lb. This installation A, providing Collins IFL 59 channel transceiver and ARC 15K case, a Flite Lines CA-1A audio amplifier and Collins VNA-1 antenna. In installation B, costing \$1,495 and weighing 94.5 lb., comprises Navco Synchro

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1016 90-channel transceiver, ARC 15E
 1017 1000 171.8 90-channel trans-
 1018 ceiver, Fibre Transceivers CA-1A, Nizco
 1019 21144 100 system, Installation C cost
 1020 58,507 installed and weight 909 li-
 1021 berests of a Line LTR-500 transceiver
 1022 with 140 transmitters and 240 receiver
 1023 channels, ARC 15E, ARC T-20 Fibre
 1024 Transceivers CA-1A and Line 2217A on
 1025 line.

Optimized Grow

Optional gear offered with the above installations includes ARC Type 31A ADI, Laser B-14D ADM, Photo-Trans 503 1 marker beacon receiver, Laser 2208B marker beacon receiver, ARC type K11ALF range receiver, ARC 15E for dual installations, Waco 708B 10 channel glide slope receiver, Collins 51 X2 marker beacon receiver and Collins 52 M3 marker beacon receiver.

Intelflex D comprises the Wilson
level 705A 560-channel receiver,
701A 560-channel transmitter, 717B
re-staffing unit, 706A 560-channel mem-
orizer, 709B audio amplifier, 700B
glance scope, 702A marker box,
and receiver 715A dynamometer power
graph and Collins 37L-5 99-channel
transmitter and 37B-1 antenna.

Options to Installation D include:
Wilson 701A ADF at 54,135, weighing 31 lb., Wilson 706A case for dual stabilizers costing 55,187 and weighing 27 lb., Wilson 704A dual ADF and 705A case at 59,045 and weighing 18 lb., Wilson 707A transmitter replacing 17L-3 and Wilson 701A ADF costing 56,617 and weighing 25 lb., Wilson 701A ADF, 705A transmitter and 706A case for 539,751 and weighing 65 lb.

Booth Model T188 shows very few basic changes over its proven design: a new 50,000 Btu heating system has a blower for ground operations, permitting cubes to be heated while on ground or off on ground. Improved noise windshield design system is fitted as standard equipment.

Cabin seat bulkhead is removable for transporting special cargo. Instrument panel is floating type, designed for easier servicing.

New Argentine Twin Starts Flight Tests

Bornes Aires—A five-place light transport, powered by two turbocharged Lycoming 150-hp engines, has begun flight tests in Argentina. Designated the 1A-43, the plane was built in Argentina's Fabrica Militar de Aviones.

Fuel capacity is 80 gal., providing a range of approximately 620 mi. Cruise speed is reported to be 160 mph. It is fully equipped for instrument flying. Wingspan is approximately 45 ft., length about 30 ft. Plane is designed to land in less than 520 ft. Landing gear is a retractable tri-cycle type.



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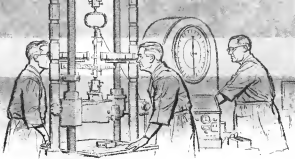
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1. Tensile strength at room temperature is in the range 200,000 to 250,000 psi, as compared with the yield at 200,000 psi, which has been given as the strength in the aircraft industry when development of the steel was begun.
2. Tensile strength at elevated temperatures is maintained with a loss of only about 10% up to 700°F.
3. Tensile strength/weight ratio is superior to most light metals at all temperatures above 200°F. At room temperature, titanium shows an advantage of about 10%.

United States Steel is keeping every resource to develop better aircraft steels. Some of the aircraft steels available include USS Tensile Stainless Steel, USS 300, USS 15-17 Steel, 4130, 4330, 4340 and 4350-V.

Write the United States Steel advertisement for further information on these new steels, or write for complete and up-to-date technical information to United States Steel, 802 William Penn Plaza, Pittsburgh 30, Pennsylvania.

USS Special Aircraft Steels

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the lowest bidder who is competent. Bomber noted that in the case of American aircraft, dollar value of contract manufacturer will increase. He also concluded that the work, volume depends on how much maintenance is retained from aircraft parts and that of the bulk of the work is returned to the U. S., contract manufacturer value will increase.

Traffic Self Control

Reference to the general trend toward more complex and rigid air traffic control rules and systems was evident in a resolution proposed by William J. Lohr, president of National Air Traffic Conference. The plan for a so-called "self-controlled" automatic flight system was not officially endorsed by NATC, but was referred to a committee for study and a report next year.

Item of the self-controlled system would be the establishment of a system of TVOR, intended to be used with a set of automatic coding and visibility rules. A pilot would fly the TVOR, then make fix, say, two minutes while allowing the bottom of the cloud layer. If no traffic appeared or entered the cloud layer, the pilot would have the legal right to climb through the overcast along a designated track to "on top." Flight could proceed from there VFR.

At destination, pilot would approach the TVOR, climb to the top of the cloud layer for a specified period, then descend on a designated heading through the overcast. Plan was authored by James Harnick, flight safety research, Grumman.

Purpose of it is allow the general pilot to escape the complication of formal air traffic control procedures. Harnick observed that after such a plan was in effect for a while, pilots using more complex ILS system would want to see the self-controlled system as all but the worst system because of its simplicity and safety.

Air Taxi Operations

National Air Traffic Conference reported a membership of 135 operators in 1957, a gain of eight over the previous year. During the year, NATC members decided to increase rates from 20 cents to 25 cents per aircraft mile, and mileage and time rates have been changed accordingly.

NATC reports air taxi operation carried 97,540 passengers during the year ending September, 1957. Load factor in this period was approximately 2.7, and operation flew 6,502,461 aircraft miles and made 17,365 instrument flights.

Decreasing aircraft and airport problems, Joseph T. Goring, Jr., manager, United Airplane General Aviation, Indianapolis, Ind., pointed the joint effort of the General Aviation Facilities Planning Group in preparing its report for

White House study on aviation facilities planning (AW Mar 28, p. 127). But he also observed that considerable public support will be necessary "and we are going to have to be pretty cautious in any approach and step in our handling of general aviation in our dealings with government officials and legislators, with aviation's other segments, airline and military, and above all in our relations with the general public."

Goring and that general aviation is in a better position to fill the nation on the value of aviation because the pilot and user is a public citizen, and aviation is a very influential one. This factor gives general aviation a better position from which to do its selling job, he said.

Suggesting two specific solutions to airport problems, Goring proposed that airports acquire the right of small general aviation to land on short runways and then establish separate traffic patterns and show simultaneous landings of transport and general aircraft. He also suggested consideration of flight steps along highways.

New Owners

In the marketing field, Goring said that sales efforts should be making near new owners. He pointed out that 71% of aircraft sold go to people who already own aircraft.

"We are not as industry, which has saturated its market and depends wholly on obsolescing old models to create new sales," he said.

Industry has the responsibility to sell the concept of aviation, according to Dr. Leslie E. Thompson, director of air air studies, General Aviation Co. He told MAXIA delegates that selling aviation involves telling the story, one and over to all segments of the U. S. public.

Selling the sportswear is a mistake, Thompson said, but aviation should sell itself on the basis of being safe, profitable, economical, modern, part of American living and modern business.

Rotor Craft Changes Throttling Controls

Changes are being made in rotorcraft-mounted rotorcraft throttling system of Rotor Craft's one-man step-on "Pinchco" helicopter as a result of analysis of a crash recently at the naval aviation flight school at Pensacola, Fla. at Fort Worth, Texas.

Captain test pilot Richard Whitehead, who suffered a fractured right ankle, severely sprained left ankle and a dislocated knee in his left foot, was able to perform a demonstration flight at Fort Worth, Texas. According to Whitehead, he had just returned and taken off for a demonstration of the Pin-

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voted themselves to a single objective—the production of better aircraft fasteners and the tools for installing them.

Tools for solving specific problems—tools for efficient production fastening—all are developed and produced in the Cherry plant at Santa Ana which is devoted exclusively to the production of fastening equipment for the aircraft industry.

For information on the most efficient fastening methods for your operation—write Townsend Company, Cherry Rivet Division, P. O. Box 2127-N, Santa Ana, California.

*Used under first patent #2,795,214-455, 2,827,370, 2,831,194, 2,831,195 and 2,834,787

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which's maneuverability when the rotor begins oversteering. In Wittenberg's words:

"I immediately began closing the throttle, but it didn't work. I then closed the shut-off valve to stop the flow of fuel to the rotor motor. In an instant the rotor began pivoting solid and the technician jumped from a car and closing speed to about 1,000 rpm. I was about 30 ft. high at the time, and thinking that the rotor blade would disintegrate at slightly more than 1,000 rpm, I immediately began trying to land. The last time I checked the tachometer, it read 1,000 rpm and I expected the rotor blades to carry away at an instant. Then I let the ground."

Rotor Club president Gilbert Magill reports that reflecting his stated and the helicopter should be firing again soon.

Project was developed for the Navy and the firm has developed some 10 variants that it can produce. In addition, Rotor Club says that it receives 10-20 requests weekly from civilians who are first steps are interested in purchasing the craft. Company says it will send Navy approval before building a commercial version.

PRIVATE LINES

Two Seattle Airlines Twin Porcupine STOL transport line been ordered by Faxon-Aircraft, Ltd. for airlift support to Shell BP Petroleum Development Co., in Nigeria.

New Canada dealer: Newark Air Service, Inc., Newark, Airport, N. J., will operate a three country route in New York, New Jersey, Dulles Aviation Corp., Atlanta, is new distributor in Georgia.

Boeing Helicopters, Inc., Danbury, Conn., has been designated as approved aircraft repair station by Civil Aeronautics Administration with limited ratings for performing extensive overhaul and inspection on helicopters.

Twelfth Annual All-Women Tour continental Air Force (Pioneer Trail Dairies) will begin at Montgomery, Field, San Diego, Calif., July 4 and terminate at Charleston, S. C., Montgomery Airport. Job 5. Aircraft meet again at Montgomery Field in job 1 for pre-overview and inspection. Co-sponsors are San Diego and Columbia chapters of Nineteen-Nines and Chapters of Commerce of San Diego and Charleston. Some 50-60 airplanes and more than 100 women pilots are expected to enter. For details write: Headquarters, All-Women Transcontinental Air Race, 2611 E. Spring St., Long Beach 5, Calif.

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Army Contracts

Washington—Following is a list of announced contracts for \$25,000 and over as released by Army Contracting Office.

ARMY ENGINEER DISTRICT, WHEELING, W.VA., Corps of Engineers, Mobile Mail Room

Build-Change Portland Ore. manufacturing two motor vehicles using government furnished structural materials and engine. Scope of contract: AFN 30 Jan 1970 AFN 15-1541 1) 7003-00

Navajo Engineering Co., Great Falls, Mont. construction and study aircraft engine engine components. Structural work and engine drive at Fairbank AFN. Mont. 1970 AFN 15-1541 1) 7003-00

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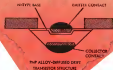
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